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<td></td>
</tr>
</tbody>
</table>
The Complaints of Patients or their Relatives about Emergency Department services in the Al-Basrah Teaching Hospital

Ahmed Z. Khalaf1, Hashim Yacoub2, Mazin A. Abdulla3, Zainab A. Al-Mayyah4

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Abstract

Introduction: Hellman explained that complaints inevitable because doctors and patients, even if they come from the same cultural background, view ill health in very different ways, and patient complaints continue to be mentioned in people talk, media in addition to tribal councils, the aim of this study was to evaluate the complaints of patients or their relatives towards the services in emergency department in the Al-Basrah Teaching hospital.

Material and Methods: This was a retrospective study done by studying all written application complaints reported to the emergency department of the Al-Basrah Teaching hospital in the south of Iraq, over a two-year period from February 2018 to February 2020. All available data, including age, gender and job of the complainants, who reported the complaint, time and reason for admission to the emergency department, the cause of dissatisfaction, against whom was the claim, where and when the complaints were received, what was the type of action or response undertaken and the opinion of the staff were evaluated and analyzed

Conclusion: Most of the complaints were avoidable and most of the cases were simple.

Key words: Patients complaints; patients and relatives complaints towards medical staff; complaints towards doctors.

Introduction

As Helman explained complaints inevitable because doctors and patients, even if they come from the same cultural background, view ill health in very different ways1, and patients complaint continue to be mentioned in people talk, media2, in addition to tribal councils.

The quality of health services delivery depends on many factors including an outcome measure which means survival and hospital stay, patient safety incidents and evaluation of complaints against individuals, departments and organizations3, 4. Complaints can be made by the patients or who represent him. Patient-physician interactions in the emergency unites are special in that prior relationships may not exist; interactions are brief, and the environment is hostile5.
Adverse outcomes caused by malpractice strongly correlate with complaints and financial penalties\textsuperscript{6, 7}.

The aim of this study was to analyze all complaints made towards emergency department of the Al-Basrah Teaching hospital over a 24 month period.

**Method**

This was a retrospective study conducted in the emergency department of the Al-Basrah Teaching hospital in the south of Iraq, over a two year period from February 2018 to February 2020. Al-Basrah Teaching hospital is a 600-bedded public hospital in the center of Basrah, with 700-1000 patients attending the outpatient clinics every day and about 1000-1250 patients attending the emergency unite every day. All available data, including age, gender and job of the complainants, who reported the complaints, time and reason for admission to the emergency department, the cause of dissatisfaction, against whom was the claim, where and when the complaints were received, what was the type of action or response undertaken and the opinion of the staff were evaluated. All the written complaints and available data were analyzed.

**Results**

There were 34 complaints related to emergency department took place within 24 months. Twenty (58.82 \%) of them were against doctors and 13 (38.24 \%) were against the hospital and one (2.94 \%) was against a nurse. All complainants 34 (100 \%) were male. Twenty four complaints (70.6 \%) were made by relatives, while those made by the patients themselves were 10 (29.4 \%). The age of most complainants 15 (44.1 \%) were in the third decade of age, followed by 9 (26.5 \%) in the fourth decade of age, 8 (23.5 \%) were in the fifth decade of age, and 2 complainant (5.9 \%) under age of 20 years. Professionally, the majority of complainants were civil servants 21 (61.7\%), followed by workers in the private sector 11 (32.4 \%), one religious man (2.9 \%), and one worker (2.9\%).

Regarding the time of admission of the patients, 17 (50\%) were admitted in day time (8.00 a.m. – 3.00 p.m.), 13 (38.2\%) were admitted in the hours between (3.00 p.m. – 12.00 a.m.), and 4 (11.8\%) were admitted in the hours between (12.00 a.m.- 8.00 a.m.).

The causes of admission were surgical reasons in 17 patients (50\%), medical reasons in 11 patients (32.4\%), and gynecological reasons in 6 patients (17.6\%), as shown in table 1.

While the reason for dissatisfaction shown in table 2.

All the complaints were reported to the Inspection Division in Basrah Health Directorate, which started investigation in nine cases and as a result of that, two warning punishments were giving for two doctors. The rest of the complaints, were solved by drawing attention of the staff, giving new instructions or waiting for completion of the investigations.

Most of the complaints, there were no clear opinion was found among the staff except in one case.
### Table 1. Reason for admission to emergency department

<table>
<thead>
<tr>
<th>Reason for admission</th>
<th>n.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abdominal pain</td>
<td>8</td>
<td>23.5</td>
</tr>
<tr>
<td>Labour pain</td>
<td>5</td>
<td>14.7</td>
</tr>
<tr>
<td>gastroenteritis</td>
<td>4</td>
<td>11.8</td>
</tr>
<tr>
<td>hypertension</td>
<td>2</td>
<td>5.9</td>
</tr>
<tr>
<td>Vaginal bleeding</td>
<td>2</td>
<td>5.9</td>
</tr>
<tr>
<td>Orthopedic problem</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Head injury</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Chest pain</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Cardiac failure</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Dysuria</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Vomiting</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>fever</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>haematamesis</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Nasal bone fracture</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>headache</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>dyspnoea</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Fracture femur</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Ureteric colic</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td><strong>total</strong></td>
<td>34</td>
<td>100</td>
</tr>
</tbody>
</table>

### Table 2. Reason for dissatisfaction

<table>
<thead>
<tr>
<th>Cause of dissatisfaction</th>
<th>n.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Doctor was not available</td>
<td>8</td>
<td>23.53</td>
</tr>
<tr>
<td>Not examined by specialist or senior resident</td>
<td>4</td>
<td>11.76</td>
</tr>
<tr>
<td>Delay in being seen</td>
<td>3</td>
<td>8.82</td>
</tr>
<tr>
<td>The patient was treated roughly or insulted</td>
<td>2</td>
<td>5.88</td>
</tr>
<tr>
<td>Referral to another hospital without explanation</td>
<td>2</td>
<td>5.88</td>
</tr>
<tr>
<td>Not allowed to stay in the ward</td>
<td>2</td>
<td>5.88</td>
</tr>
</tbody>
</table>
**Discussion**

Dissatisfaction arises when the expectations are not met, that is why it becomes an inevitable part of clinical care and complaints against institute staff, regulations, procedures, and services occur.

Health care services are provided to patients in an environment with complex interactions among many factors, such as the disease process itself, clinicians, technology, policies, procedures, and resources. In this study, we investigated the reason of complaints, complainant’s characteristics and the outcomes of the complaints process in the emergency department of the Al-Basrah Teaching hospital which is a large hospital with a high referral rate for surgical, medical, gynecological and pediatric and other medical and surgical branches services. This was the first kind of studies ever done in our hospital.

More than two thirds, 76% of the patients were admitted for mild, non-life threatening conditions such as gastroenteritis, vomiting, dysuria, etc., while 8 patients, 5% had more serious conditions. This is in contrast to other study by Behcet et al., who found that all the patients had a mild condition. Surprisingly the major cause of dissatisfaction that observed in (23.53%) were absence of emergency doctors, absence of specialist doctors or more senior doctors observed in (11.67%), delay in clinical examination observed in (8.82%), and insufficient care with rough handling of the patients observed in (5.88%). This means that more than one third (35.2%) of the complaints were due to the absence of the doctors, a major concern which need utmost care and quick solution.

It is known that delay in providing health care initiates dissatisfaction, but this usually occurred when the waiting time is more than 90 minutes, in our study, we found that 8.82% of the complaints was due to delay in the examination with no recording available for the waiting time. To come up this issue, it is essential to provide adequate number of the staff and continuous public education regarding utilization of emergency department services and among other suggestions is introducing activities during waiting

<table>
<thead>
<tr>
<th>Reason for dissatisfaction</th>
<th>Count</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>No air conditioning or services</td>
<td>2</td>
<td>5.88</td>
</tr>
<tr>
<td>No female nurse</td>
<td>2</td>
<td>5.88</td>
</tr>
<tr>
<td>Waiting for long time for ECG or CT scan</td>
<td>2</td>
<td>5.88</td>
</tr>
<tr>
<td>Asking for money</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>No female doctor</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>No ambulance available</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Delayed blood transfusion</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>Receiving treatment without being examined</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>No follow up</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td>No ultrasonic examination at night</td>
<td>1</td>
<td>2.94</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>
and keeping the patients and their relatives’ informed².

Rough handling of the patients accounted for 5.88% of complaints with similar percentage for failure to provide a convincing and suitable explanation before referring the patient to another hospital. Other similar found similar results¹²-¹⁴.

Poor or failure in communication skills has been identified as an important factor in patient dissatisfaction¹⁵, ¹⁶. Complaints that rose due to communication problems usual mentioned in the literatures among the top categories², ¹⁶.

Teaching communication skills would help in overcoming this problem as breaking bad news, dealing with angry patient and so on, is vital in undergraduate medical study and should continue during postgraduate training. In addition, performing staff seminar on handling difficult patient or relatives can help the staff to manage these kinds of patients carefully. Other studies showed that clinically focused customer service training improves patient satisfaction and ratings of physician and nurse skill. They also suggest that such training may offer a substantial competitive market advantage, as well as improve the patients’ perception of quality and outcome¹⁷, ¹⁸.

Other causes of dissatisfaction occurred because of limited resources, lack of some instruments, shortage of the working staff, and bad services. Patient satisfaction is an integral component of the measurement of health care quality. Proper attention to patient complaints is one part of a patient satisfaction management strategy aimed at revealing and alleviating the causes of patient dissatisfaction¹⁹.

Regarding complainant’s characteristics, all the complaints were men in contrast to other similar study from Turkey⁶, where most of the complainants were women, the majority were civil servants in their third decade.

The limitations of this study were lack of details in patients records beside that verbal complaint were not mentioned so it is difficult to determine the rate of dissatisfaction and the actual degree of complaints.

**Conclusion**

Although, the problem of patient’s complaints is not well documented in developing countries², it remains an important part of evaluation of quality of health service. Most of the complaints were due to mild cases and can be avoided by simple measures. This study highlights certain issues which need a suitable care and solution.

**Ethical Clearance:** Taken by the ethics Committees of the Training and Human Development Center of the Al-Health Directorate in 12-25-2017 no. 204. All participants gave written informed consent.

**Funding:** Self-funded research

**Conflict of Interest:** Nil.

**References**


18. Patient satisfaction is an integral component of the measurement of health care quality. Proper attention to patient complaints is one part of a patient satisfaction management strategy aimed at revealing and alleviating the causes of patient dissatisfaction.

Acute Suppurative Thyroiditis in Post Cimino Infection Patient

Ferdy Royland Marpaung1, Sidarti Soehita1
1Department of Clinical Pathology, Faculty of Medicine Universitas Airlangga, Dr Soetomo Academic Hospital Surabaya Indonesia

Abstract
Acute suppurative thyroiditis (AST) is a rare clinical case that must be treated immediately because of its fatality, especially cases of swelling on thyroid area accompanied by fever. AST is often preceded by infection, therefore it is necessary to find the source. A 40 years old woman came to the hospital with complain of pain on the swollen neck, difficulty on swallow and fever. The patient suffered from chronic kidney disease (CKD). One week before she had an AV hemodialysis shunt infection. Laboratory results showed an increase of fT4 3.5 ug/dL and a decrease in TSH (0.015 uIU/mL), leukocytosis and an increase of CRP. Thyroid ultrasound showed an abscess in entire left thyroid while thyroid lobe FNAB showed AST. Pus culture showed the growth of Staphylococcus aureus bacteria. Thyroid test supported an AST with hyperthyroidism and should be treated immediately. Three weeks after treatment the patient was euthyroid and had drainage of the pus. AST occurred due to hemodialysis AV shunt infection. Laboratory results show the presence of leukocytosis and increased of CRP levels, supporting signs of inflammation. Pus culture revealed significant growth of Staphylococcus aureus and improved with Clyndamycin therapy. To our knowledge, this is the first AST case preceded by hemodialysis AV shunt infection. Cases of swelling on thyroid, painful swallowing, fever, preceded by a shunt AV hemodialysis infection were considered to examine thyroid markers, ultrasound and FNAB for early diagnosis of AST because it can be life-threatening.

Keyword: Acute suppurative thyroiditis, Hyperthyroid, Chronic Kidney Disease, Arteriovenous Shunt, Hemodialysis

Introduction
Thyroiditis is an inflammation of the thyroid that can be caused by various conditions. Conditions that can cause this include autoimmune disorders, viral, bacterial, fungal and other infections1. Acute suppurative thyroiditis (AST) is a very rare type of thyroiditis. Thyroid abscess and AST account for only 0.1%–0.7% of all thyroid disorders. AST is common in patients with Hashimoto’s thyroiditis and thyroid cancer. AST is associated with the persistence of ducts originating from the 3rd or 4th bronchial sac which can lead to recurrent thyroid abscess. Most cases of infection spread to the thyroid gland via a piriform sinus shunt. The left lobe of the thyroid gland is more commonly affected. AST can be life-threatening if not treated promptly, and result in 12% or more in mortality due to thyroid storm and sepsis2. The diagnosis of AST is often delayed due to atypical clinical features. AST is rare because the anatomical and physiological characteristics of the gland have unique infection resistance, namely the bactericidal nature of colloidal materials, increased vascularity, and the presence of iodine in the thyroid gland. A thyroid abscess presents as a very painful swelling. The differential diagnosis for thyroid gland pain is

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E-mail: ferdyoke@gmail.com
very limited, the most common being subacute and chronic thyroiditis.

**Case Report**

A 40-year-old woman was admitted to the hospital with the chief complaint of swollen neck pain for 2 days accompanied by difficulty swallowing and fever. The patient has never had the same complaint before. One week before, the patient had surgery due to infection in the AV hemodialysis shunt. The patient had history of chronic kidney failure (CKD) stage V about 1 month ago and routinely underwent hemodialysis (2x/week). The patient suffered from hypertension about 7 years ago. There was no history of Diabetes Mellitus and thyroid disorders.

**Physical examination (upon arrival at ER)**

The patient was generally weak, conscious (GCS 4-5-6), blood pressure 110/70 mmHg, pulse of 92 x/minute, respiration rate of 20 x/minute, axilla temperature of 38 °C. Other physical examination revealed left anterior swelling of neck (warm +, supple +, tenderness +, size 4-5 cm, up and down when swallowing and painful) (Figure 1).

![Figure 1. The left neck is swollen and painful](image)

**Supporting examination**

**Table 1. Hematological examination**

<table>
<thead>
<tr>
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<th>25/9</th>
<th>1/10</th>
<th>3/10</th>
<th>12/10</th>
</tr>
</thead>
<tbody>
<tr>
<td>WBC (x 103/µL)</td>
<td>17.15</td>
<td>22.98</td>
<td>8.62</td>
<td>7.07</td>
</tr>
<tr>
<td>Neu (%)</td>
<td>87.1</td>
<td>86.3</td>
<td>77.8</td>
<td>72.0</td>
</tr>
<tr>
<td>Lym(%)</td>
<td>8.4</td>
<td>6.53</td>
<td>17.41</td>
<td>11.9</td>
</tr>
<tr>
<td>Mono (%)</td>
<td>3.6</td>
<td>5.34</td>
<td>6.55</td>
<td>8.2</td>
</tr>
<tr>
<td>Eos (%)</td>
<td>0.2</td>
<td>0.01</td>
<td>0.59</td>
<td>0.5</td>
</tr>
<tr>
<td>Baso(%)</td>
<td>0.5</td>
<td>0.44</td>
<td>0.6</td>
<td>0.2</td>
</tr>
<tr>
<td>RBC x 106/µL</td>
<td>4.08</td>
<td>4.030</td>
<td>4.126</td>
<td>3.95</td>
</tr>
<tr>
<td>Hb (g/dL)</td>
<td>8.7</td>
<td>8.3</td>
<td>6.7</td>
<td>7.7</td>
</tr>
<tr>
<td>Hct %</td>
<td>36.8</td>
<td>36.64</td>
<td>35.28</td>
<td>33.2</td>
</tr>
<tr>
<td>MCV (fL)</td>
<td>90.2</td>
<td>85.94</td>
<td>85.51</td>
<td>84.1</td>
</tr>
<tr>
<td>MCH (pg)</td>
<td>30.2</td>
<td>30.43</td>
<td>30.93</td>
<td>29.9</td>
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<tr>
<td>MCHC (g/dL)</td>
<td>33.5</td>
<td>35.41</td>
<td>36.17</td>
<td>35.5</td>
</tr>
<tr>
<td>RDW (%)</td>
<td>14.1</td>
<td>13.03</td>
<td>12.75</td>
<td>13.2</td>
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<tr>
<td>Platelet(x103/µL)</td>
<td>100</td>
<td>121</td>
<td>114</td>
<td>128</td>
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### Table 2. Clinical chemistry examination

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<th>4/10</th>
<th>7/10</th>
<th>14/10</th>
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<tbody>
<tr>
<td>Na (mmol/L)</td>
<td>133</td>
<td>139</td>
<td>140</td>
<td>135</td>
<td>134</td>
<td>136-144</td>
</tr>
<tr>
<td>K (mmol/L)</td>
<td>5.1</td>
<td>4.1</td>
<td>3.5</td>
<td>4.9</td>
<td>3.6</td>
<td>3.8 – 5.0</td>
</tr>
<tr>
<td>Cl (mmol/L)</td>
<td>100</td>
<td>99</td>
<td>105</td>
<td>104</td>
<td>103</td>
<td>97-103</td>
</tr>
<tr>
<td>Ca (mg/dL)</td>
<td>7.2</td>
<td>8</td>
<td>8.6</td>
<td>-</td>
<td>8.4</td>
<td>8.5-10.1</td>
</tr>
<tr>
<td>Pho (mg/dL)</td>
<td>6</td>
<td>6.1</td>
<td>5.6</td>
<td>-</td>
<td>-</td>
<td>2.5-4.9</td>
</tr>
<tr>
<td>Alb (g/dL)</td>
<td>3.2</td>
<td>3.1</td>
<td>3.2</td>
<td>3.4</td>
<td>3.1</td>
<td>3.4-5.0</td>
</tr>
<tr>
<td>UA (mg/dL)</td>
<td>10.4</td>
<td>4.9</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2.6-7.2</td>
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<tr>
<td>CRP (mg/dL)</td>
<td></td>
<td>12</td>
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<td></td>
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### Table 3. Thyroid plasma examination

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<th>12/10</th>
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<th>Ref Range</th>
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</thead>
<tbody>
<tr>
<td>fT4 (ug/dL)</td>
<td>3.5</td>
<td>3.73</td>
<td>1.8</td>
<td>1.68</td>
<td>1.21</td>
<td>0.89-1.76</td>
</tr>
<tr>
<td>TSH (uIU/nL)</td>
<td>0.015</td>
<td>0.015</td>
<td>0.02</td>
<td>0.018</td>
<td>0.02</td>
<td>0.55-4.78</td>
</tr>
<tr>
<td>Anti TPO (IU/mL)</td>
<td>Neg (27)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&lt;50: neg</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>50-75: BL</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>&gt;75: pos</td>
</tr>
<tr>
<td>Anti TRAb (IU/L)</td>
<td>Neg</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.00-1.73</td>
</tr>
</tbody>
</table>

### Table 4. Immunology examination

<table>
<thead>
<tr>
<th>Parameter</th>
<th>4/10</th>
<th>9/10</th>
<th>Ref Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBsAg</td>
<td>Non Reactive</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>HIV</td>
<td>Non Reactive</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>ANA tets</td>
<td>-</td>
<td>24.56</td>
<td>-</td>
</tr>
<tr>
<td>C3 (mg/L)</td>
<td>-</td>
<td>85</td>
<td>-</td>
</tr>
<tr>
<td>C4 (mg/dL)</td>
<td>-</td>
<td>49</td>
<td>-</td>
</tr>
</tbody>
</table>
Thyroid Ultrasound Results (8/10)

There is an abscess in the entire left lobe of the thyroid with a size of 3.54 x 2.2 x 5.49 cm.

Thyroid FNAB Results (1/10)

The smear contains a distribution of lymphocytes and PMN cells as well as macrophage cysts against a broader erythrocyte background. Conclusion: Acute suppurative thyroiditis (Figure 2).

Figure 2. FNAB results show an AST

Pus culture examination (14/10):

There was a growth of Staphylococcus aureus with antimicrobial sensitivity results showed Sensitive to Gentamycin, Ampicillin-Sulbactam, Oxacillin, Cotrimoxazole, Erythromycin, Clindamycin, Quinopistarine-Dalfopristine, Levofloxacin, Movifloxacin, but Resistance to Ampicillin and Tetracycline.

Head and Neck Surgery Division Consultation

Head and neck surgery division plan to do drainage-incisions thyroid abscess after patient had euthyroid state condition. The diagnosis was Acute Suppurative Thyroiditis (pro-drainage-incision) + Hyperthyroid + Chronic Kidney Diseases stage V with regular hemodialysis.

Therapy:

1. High in calories and low in protein 2100 kcal
2. Amlodipine 1x10mg oral
3. Paracetamol 3x500mg oral
4. Injection of Ceftriaxon 2x1g Intravenous change to Clindamycin 2x300 mg po (starting day 14)
5. Thyrozol 1x10mg oral, increase 3x10 mg (day 14)
6. Propranolol 3x10mg oral (14th day)
7. Folic acid 3x1mg oral
8. Hemodialysis as scheduled 2x a week

Discussion

Abscess formation frequently occurs in children due to anatomic abnormalities of the hypopharyngeal region in result of piriform sinus fistulas. The occurrence of thyroid abscess in adults is extremely rare and may be caused by various causes such as foreign body trauma (FNAB, fishbone) and anatomical pressure. Hematogenous spread from distant sites is known to be the most common cause of thyroid infection, although the exact mechanism is unknown. The manifestation of thyroiditis is mostly local pain in the involved lobe, accompanied by pain and difficulty of swallowing. Symptoms of fever and chills may occur depending on the virulence of the microorganism and the occurrence of sepsis.1-2,4-8

Primary thyroid abscess from AST is a rare type of head and neck infection because the thyroid gland is known to have infection-fighting mechanisms. Thyroid protection includes rich blood supply and lymphatic drainage, high iodine content of the gland which is bactericidal, certain range of the gland from other neck structures by the facial plane, and formation of hydrogen peroxide within the gland for thyroid hormone synthesis. AST by bacterial infection is usually more painful than patients with subacute
thyroiditis. Subacute thyroiditis usually displays as severe localized tenderness, but is less likely to be thyrotoxicosis (60% of patients). 

This patient had left neck lump pain following fever and strain in swallowing. It was suspected that there was a hemogenous spread of bacteria creating thyroid infection because the patient had just had an AV hemodialysis shunt transfer operation 1 week earlier. Prior to the surgery, the patient experienced fever, chills, and the left AV hemodialysis shunt was starting to be red, enlarged and painful bump.

The patient has leukocytosis and elevated CRP that supports signs of inflammation. High FT4 levels and low TSH levels indicate a hyperthyroid condition. Hyperthyroidism in thyroiditis may occur naturally over weeks to months. The process continues until a condition of disequilibrium occurs—a condition of hypothyroidism with low TSH. These patients should be treated immediately because AST is a life-threatening condition (12% of mortality if not treated immediately). Mortality may occur in result of thyroid storm and sepsis. Thyroid storm generates when hyperthyroidism is not treated, resulting in symptoms of fever, increased pulse, blood pressure, nausea, vomiting and agitation.

Ultrasound examination revealed abscess in the thyroid gland or evidence of enlargement lobe, while FNAB determine the presence of infection as it is possibly done simultaneously with culture. 

The results of the patient’s ultrasound concluded that there was an abscess in almost the entire left lobe of the thyroid with a size of 3.54 x 2, 2 x 5.49 cm. FNAB results showed that the smear contained the distribution of lymphocytes and PMN cells and cyst macrophages with an erythrocyte background, no signs of malignancy were found.

This patient was planned for drainage-incision of the thyroid abscess after euthyroid status. Base incision and drainage is a necessary surgical procedure as therapy, but care must be taken to treat hyperthyroidism first to avoid postoperative thyroid storm situation and other unwanted metabolic effects.

Appropriate antibiotics should be given accordingly to the causative organism. Pus culture results of this patient exhibited significant growth of Staphylococcus aureus. The patient came to the hospital and received an injection of Ceftriaxone 2 x 1 gram intravenous as empiric treatment. Furthermore, after the results of the pus culture antibiogram released, the patient’s antibiotic was changed to Clindamycin 2 x 300 mg oral (starting on the 14th day).

The patient also suffers from chronic kidney failure (CKD) which is able to cause immune system disorders. Disorders can be in the form of systemic inflammation and immunosuppression. 

There is an increase in proinflammatory cytokines in CKD such as pentraxine, in addition to dysfunction of phagocytes, B and T cells. Hemodialysis therapy is the key to improving the general condition and the patient’s immune system.

The patient had incision and drainage done after normal thyroid levels. The prognosis is excellent with general maintenance of thyroid function, however, post-thyroiditis thyroid function tests should be monitored to ensure that a thyroid disorder is not present.

To our knowledge, this is the first case report of suspected hemodialysis AV shunt infection causing hemogenous spread to the thyroid organ leading to AST.

**Conclusion**

The patient was diagnosed with AST which was probably caused by post-infectious AV shunt hemodialysis. Cases of neck swelling and fever
after infection with AV hemodialysis shunt are recommended for a thorough thyroid testing, ultrasound and FNAB for early diagnosis of AST because its life-threatening threat.

Conflict of Interest: The author declare that they have no conflict of interest.

Source of Funding: None.

Acknowledgements: We would like to thank the patient who have voluntarily participated

Ethical Approval: This study approved by the Ethics Committee of Dr Soetomo Academic Hospital

References

Factors Associated with Pregnancy at Risk for Obstetric Emergency in Pregnant Women at Koya Barat Health Center Jayapura City Papua

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Abstract

Background: Indonesia is currently still faced with a high maternal mortality rate (MMR). To end this maternal mortality rate, one of the national priority commitments is to end maternal mortality during pregnancy and childbirth. The maternal mortality rate (MMR) for Papua Province according to the Papua Province Health Profile 2019 are 61.3/100,000 deliveries and the Infant Mortality Rate (IMR) are 6/100,000 live births, while the case of maternal mortality in 2018 in Jayapura City are 58/100,000 live births. Objectives: This study aims to determine the factors associated with Pregnancy at Risk for Obstetric Emergency in pregnant women at the Koya Barat Health Center. Methods: This research is an analytical research with a cross sectional approach using Maternal and Child Health (MCH) records at the Koya Barat Health Center in 2020. The population of this study was pregnant women at the Koya Barat Health Center in 2020, as many as 261 mothers. The sampling technique is saturated sampling. The data was processed using the Chi-square test, the Prevalence Ratio Test, and Logistic Regression. Result: The results of the bivariate analysis showed that Education (p < 0.001; RP = 1.72; 95% CI: 1.3-2.1), age (p = 0.00<0.05; RP = 1.98; 95% CI: 1.6-2.4), parity (p < 0.001; RP = 2.08; 95% CI: 1.68-2.5), Hb level (p = 0.005; RP = 1.44; 95% CI: 1.11-1.83 , the state of the birth canal (p < 0.001; RP = 2.25; 95% CI: 1.76-2.88), and the state of the fetus (p < 0.001; RP = 1.88; 95% CI: 1.53-2.31) had a significant relationship with pregnancy at risk of obstetric emergency in pregnant women at Koya Barat Health Center, while history of disease (p = 0.44; RP = 1.14; 95% CI: 0.86-1.52) did not have a significant relationship with risk of obstetric emergency in pregnant women at Koya Barat Health Center. The most dominant risk factor for pregnancies at risk for Obstetric Emergency in pregnant women at the Koya Barat Health Center was the condition of the fetus (p = 0.001; RP = 13.4 3.507; 95% CI: 3.09 - 58.1).

Keywords: Pregnancy, risk, obstetric emergenc, koya barat health center

Introduction

Indonesia is currently still faced with a high maternal mortality rate (MMR). To end this maternal mortality rate, one of the national priority commitments is to end maternal mortality during pregnancy and childbirth. The results of the 2015 Inter-Census Population Survey (SUPAS), Indonesia’s MMR is still high at 305 per 100 thousand live births.1
According to the research of the director of the Women Research Institute, Edriana Noerdin, the main causes of maternal mortality in Indonesia are bleeding and infection. One of the causes of these two things is abortion. 15 percent of abortions in Indonesia occur in women under the age of 20 years and about 2.3 million abortions occur every year in Indonesia. As many as 1 million spontaneous miscarriages, 700 thousand due to unwanted pregnancies and 600 thousand due to family planning failures.

The maternal mortality rate (MMR) for the province of Papua according to the Papua Province Health Profile 2019 are 61.3/100,000 deliveries and the Infant Mortality Rate (IMR) are 6/100,000 live births, while the case of maternal mortality in 2018 in Jayapura City are 58/100,000 live births.

Some pregnancies are at risk for an obstetric emergency, which is unpredictable or unavoidable. The risk of a possible pregnancy at risk of an obstetric emergency in each mother is different according to the conditions during pregnancy whether the woman is pregnant without experiencing problems (low risk pregnancy group) or pregnant woman has problems / risk factors (high risk pregnancy group and very high-risk pregnancy group). The higher the level of risk of risk factors in pregnant women, the higher the mother will experience childbirth complications.

The results of the research by Sari and Absari (2018) also mention that there is a significant relationship between the condition of the fetus (fetal distress) with Section Caesarea in the moderate category and having a mother with fetal distress has a 1.358 times risk for section caesarean compared to mothers without emergency fetus.

The results of Paat’s research (2015) say that risky pregnancies such as the location, shape of the fetus and birth canal factors are the cause of delivery complications (dystocia). Under normal circumstances, the lowest position of the fetus is the back of the head, the baby’s shape, weight, position and location in its development until the end of pregnancy and is ready to be born, the baby has the power to push himself out so that labor is spontaneous.

The data on Maternal and Child Health reports at the Koya Barat Health Center is known that most pregnant women at the Koya Barat Health Center in 2020 are included in the category of high-risk pregnancies experiencing Obstetric Emergency, namely 133 respondents (51.0%), and 128 respondents (49.0%) with low-risk pregnancies.

The results of the screening of pregnant women at the Koya Barat Health Center in 2020 with a Poedji Rochjati Scorecard that not only found one complication that accompanies pregnancy in the mother but there were several complications found in one mother including anemia, poor obstetric history, maternal problems with a history of co-morbidities, the presence of complications of the birth canal, and the state of the fetus with indications of some problems in pregnancy. Many pregnant women were declared to have a high-risk pregnancy condition at the monitoring of the ANC examination at the Koya Barat Health Center.

Based on the data above, it encourages researchers to find out what factors are associated with risky pregnancies in pregnant women at the Koya Barat Health Center in 2020?

Materials and Method

The type of research used was analytical research with a cross sectional approach, namely research where the independent and dependent variables were measured at one time. The study was conducted in February 2021. The sampling technique used was saturated sampling based on the secondary data from the Koya Barat Health Center. The number of samples was 261 pregnant women at the Koya Barat Health Center.
Center in 2020. The data were analyzed using chi-square and multiple logistic regression for multivariate data analysis.

Findings

a. Univariate Analysis

Table 1. Distribution of variables related to pregnancy at risk of Obstetric Emergency in pregnant women at the Koya Barat Health Center

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Frequency (n)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s Education</td>
<td>Elementary (Middle School)</td>
<td>86</td>
<td>33.0</td>
</tr>
<tr>
<td></td>
<td>Advanced (&gt; Middle School)</td>
<td>175</td>
<td>67.0</td>
</tr>
<tr>
<td>Age</td>
<td>At risk (&lt;20 yr and &gt;35 yr)</td>
<td>69</td>
<td>26.4</td>
</tr>
<tr>
<td></td>
<td>No Risk (20-35 years old)</td>
<td>192</td>
<td>73.6</td>
</tr>
<tr>
<td>Parity</td>
<td>≥ 4</td>
<td>72</td>
<td>27.6</td>
</tr>
<tr>
<td></td>
<td>&lt; 4</td>
<td>189</td>
<td>72.4</td>
</tr>
<tr>
<td>Hb level</td>
<td>Anemia</td>
<td>134</td>
<td>51.3</td>
</tr>
<tr>
<td></td>
<td>No Anemia</td>
<td>127</td>
<td>48.7</td>
</tr>
<tr>
<td>History of co-morbidities</td>
<td>There’s History</td>
<td>59</td>
<td>22.6</td>
</tr>
<tr>
<td></td>
<td>No History</td>
<td>202</td>
<td>77.4</td>
</tr>
<tr>
<td>Birth Road Condition</td>
<td>There are Complications</td>
<td>103</td>
<td>39.5</td>
</tr>
<tr>
<td></td>
<td>No complications</td>
<td>158</td>
<td>60.5</td>
</tr>
<tr>
<td>Fetal State</td>
<td>Presentation Not Head</td>
<td>25</td>
<td>9.6</td>
</tr>
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<td></td>
<td>Head Presentation</td>
<td>236</td>
<td>90.4</td>
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<td>Risky Pregnancy</td>
<td>High Risk</td>
<td>133</td>
<td>51.0</td>
</tr>
<tr>
<td>Obstetric emergency</td>
<td>Low Risk</td>
<td>128</td>
<td>49.0</td>
</tr>
</tbody>
</table>

Source: Secondary data, 2020
**b. Bivariate Analysis**

**Table 2. Relationship of independent variables with Pregnancy at Risk for Obstetric Emergency in pregnant women at Koya Barat Health Center**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Risky pregnancy</th>
<th>P-Value</th>
<th>RP</th>
<th>CI (95%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Risk</td>
<td>Low Risk</td>
<td>Total</td>
<td>Lower</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>-----------</td>
<td>-----------</td>
<td>--------</td>
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<td>Education</td>
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<td></td>
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<tr>
<td>Elementary</td>
<td>60</td>
<td>26</td>
<td>86</td>
<td>1.72</td>
</tr>
<tr>
<td>Advanced</td>
<td>71</td>
<td>104</td>
<td>175</td>
<td>0.000</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>At risk</td>
<td>52</td>
<td>13</td>
<td>65</td>
<td>1.98</td>
</tr>
<tr>
<td>No risk</td>
<td>79</td>
<td>117</td>
<td>196</td>
<td>0.000</td>
</tr>
<tr>
<td>Parity</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>≥4</td>
<td>58</td>
<td>14</td>
<td>72</td>
<td>2.08</td>
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<tr>
<td>&lt;4</td>
<td>73</td>
<td>116</td>
<td>189</td>
<td>0.000</td>
</tr>
<tr>
<td>Hb level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anemia</td>
<td>79</td>
<td>55</td>
<td>134</td>
<td>0.005</td>
</tr>
<tr>
<td>No Anemia</td>
<td>52</td>
<td>75</td>
<td>127</td>
<td>1.44</td>
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<tr>
<td>History of co-morbidities</td>
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<td></td>
</tr>
<tr>
<td>There’s History</td>
<td>28</td>
<td>22</td>
<td>50</td>
<td>0.44</td>
</tr>
<tr>
<td>No History</td>
<td>103</td>
<td>108</td>
<td>211</td>
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</tr>
<tr>
<td>Birth Road Condition</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>There are Complications</td>
<td>78</td>
<td>25</td>
<td>103</td>
<td>0.000</td>
</tr>
<tr>
<td>No complications</td>
<td>53</td>
<td>105</td>
<td>158</td>
<td>1.537</td>
</tr>
<tr>
<td>Fetal State</td>
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<td></td>
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</tr>
<tr>
<td>Presentation Not Head</td>
<td>21</td>
<td>3</td>
<td>24</td>
<td>0.000</td>
</tr>
<tr>
<td>Head Presentation</td>
<td>110</td>
<td>127</td>
<td>237</td>
<td>1.537</td>
</tr>
</tbody>
</table>

*Source: Secondary data, 2020*
Based on table 2 above, it can be seen that of the seven variables studied, it was known that there was only one variable that was not significant, namely the history of disease with a P value of 0.44 or greater than alpha 0.05. Meanwhile, other variables such as education, age, parity, HB levels, the condition of the birth canal and the condition of the fetus were all significantly related to pregnancies at risk for Obstetric Emergency.

c. Multivariate Analysis

Table 3. Final Results of the Multivariate Logistics Regression Model Pregnancy at risk of Obstetric Emergency in pregnant women at the Koya Barat Health Center

<table>
<thead>
<tr>
<th>No.</th>
<th>Risk Factor</th>
<th>Category</th>
<th>OR</th>
<th>CI 95%</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Fetal State</td>
<td>Presentation Not Head</td>
<td>13.4</td>
<td>3.09-58.1</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Head Presentation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Parity</td>
<td>≥ 4</td>
<td>9.83</td>
<td>4.47-21.5</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt; 4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Age</td>
<td>At risk</td>
<td>6.82</td>
<td>2.88-16.14</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No risk</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Birth Road Condition</td>
<td>There are Complications</td>
<td>4.13</td>
<td>2.1-8.07</td>
<td>0.001</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Normal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Hb level</td>
<td>Anemia</td>
<td>3.55</td>
<td>1.78-7.08</td>
<td>&lt; 0.01</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No Anemia</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Secondary data, 2020

Based on table 3 above, it was known that the dominant factors for pregnancy at risk of obstetric emergency in pregnant women at the Koya Barat Health Center were the condition of the fetus, parity, age, birth canal condition, and HB levels.

Discussion

1. Relationship of age with pregnancy risk of obstetric emergency.

The relationship between age and pregnancy at risk for obstetric emergencies shows that mothers at risk of giving birth at the age of ≤ 19 years and > 35 years are most likely to have the potential to experience pregnancies at risk for obstetric emergencies. 80% of pregnant women with the age of ≤ 19 years and > 35 years have risky pregnancies. The results of the chi-square test obtained p-value = 0.000 (<0.05), it is concluded that there is a significant relationship between maternal age and the incidence of risky pregnancies in pregnant women at the Koya Barat Health Center.

The Prevalence Ratio (RP) of maternal age ≤ 19 years and > 35 years for at-risk pregnancies at Koya Barat Health Center is 1.98 with 95% CI (1.6-2.4).
This means that pregnant women with a risky age (age ≤ 19 years and > 35 years) have a 1.98 times greater risk of having a risky pregnancy than mothers with an age > 19 years and ≤ 35 years. The results of the logistic regression test showed that age was the dominant factor in the incidence of pregnancy at risk of obstetric distress.

The Results of research conducted by Dr. Deirdre Murphy of Trinity College in Dublin in 2011 showed that a woman’s age at delivery can influence the risk of birth complications. They found that women who gave birth in their teens were at risk of giving birth prematurely. Meanwhile, women who give birth at an old age are at risk of giving birth by caesarean section. Murphy and colleagues conducted a study on 36,916 women who gave birth for the first time between 2000 and 2011. Researchers mainly looked at women who gave birth too young or too old. The result, only about six percent of mothers aged 20-34 years who gave birth prematurely, compared with 10 percent of mothers aged under 20 years who gave birth prematurely. Even so, women who are young at the time of delivery are at a lower risk of giving birth by caesarean section.10

According to Susanti (2008) in Rinata and Andayani (2018), that maternal age < 20 years and ≥ 35 will have an impact on feelings of fear and anxiety before the delivery process. Because if the mother is pregnant at that age, her pregnancy is included in the category of high-risk pregnancy and a mother who is older will have a high potential to give birth to a baby with birth defects.11

According to Manuaba (2019), that at the age of a woman is too young or under 20 years old, she does not yet have mature reproductive organs and the condition of the uterus is not perfect for pregnancy and childbirth so that it can harm the health of the mother as well as the development and growth of the fetus. Meanwhile, for women who are more than 35 years old, it is possible for obstetric complications to occur because their reproductive health has declined and the mother is too weak to push during childbirth.12

According to Mappaware (2019) that at a too young age, a woman’s reproductive organs are not overall good and her psychological development is not ready to become a mother and accept her pregnancy where this can result in pregnancy disorders that can increase maternal and perinatal mortality.13

2. Relationship of Parity with Pregnancy at risk of obstetric emergency

The relationship between parity and pregnancy at risk for obstetric emergencies shows that women giving birth with a number of children ≥ 4 are most likely to have the potential to have pregnancies at risk for obstetric emergencies. As many as 80.6% of mothers with parity ≥ 4 are included in the category of pregnancy at risk for obstetric emergencies. The results of the chi-square test obtained p-value = 0.000 (< 0.05), it is concluded that there is a significant relationship between parity and pregnancy at risk of obstetric emergency in pregnant women at the Koya Barat Health Center.

The prevalence ratio (PR) of parity to pregnancies at risk for obstetric emergencies at the Koya Barat Health Center is 2.08 with a 95% CI (1.68-2.5). This means that mothers who give birth with a number of children ≥ 4 have a 2.08 times greater risk of having a pregnancy at risk of an obstetric emergency than mothers with a number of children <4.

The results of research by Rinata and Andayani (2018) on parity and anxiety showed that most (69.6%) pregnant women with multigravida parity, while the rest (30.4%) with primigravida parity. According to him, a woman’s parity can affect the psychological health of pregnant women, especially in the third trimester pregnant women who will face the delivery process.11 The same thing was stated by
Triana that the higher the parity of the mother, the poorer the endometrium. This can affect the next pregnancy because the condition of the mother’s uterus has not recovered to get pregnant again due to reduced vascularity or atrophic changes in the decidua due to past deliveries so that it can result in fetal death in the womb.\textsuperscript{14}

According to Hall, et al. (2015) the number of previous deliveries was associated with preterm delivery (p-value > 0.05).\textsuperscript{15} According to Yetti (2010), reproductive status factors related to the incidence of pregnancy at risk of obstetric distress are parity of one or \( \geq \) four children, the presence of pregnancy complications and a history of previous childbirth complications.\textsuperscript{16} A woman who has been pregnant 6 or more times, is more likely to have weak contractions during labor (because her uterine muscles are weak), bleeding after delivery (because her uterine muscles are weak), rapid labor which can increase the risk of heavy vaginal bleeding, placenta previa (low-lying placenta).\textsuperscript{12}

3. Relationship of Hb Levels with pregnancy at risk of obstetric emergency

The relationship between Hb levels and pregnancies at risk for obstetric emergencies shows that pregnant women with anemia are more likely to have a pregnancy at risk for obstetric emergencies. Pregnant women with anemia of 59% experienced pregnancy at risk of obstetric emergency. The results of the Chi-Square test obtained p-value = 0.000 (< 0.05), it is concluded that there is a significant relationship between Hb levels and pregnancy at risk of obstetric emergency in pregnant women at the Koya Barat Health Center.

The prevalence ratio (PR) of anemia to the incidence of pregnancy at risk for obstetric emergencies at the Koya Barat Health Center is 1.44 with a 95% CI (1.11-1.83). This means that pregnant women with anemia have a 1.44 times greater risk of having an obstetric emergency risk pregnancy than mothers who are not anemic.

Mothers with low hemoglobin levels are at risk for infection, prolonged labor due to fatigue of the uterine muscles in contracting (uterine inertia), postpartum bleeding due to the absence of uterine muscle contractions (uterine atony), shock, abortion, premature birth, and severe anemia that can cause decompensation cords. Hypoxia due to anemia causes shock and maternal death in childbirth. Repeated pregnancies in a short time can also be a factor in the mother experiencing anemia because this will deplete the mother’s iron reserves. Good pregnancy spacing (at least 2 years) is important to note so that the mother is ready to receive the fetus again without depleting her iron reserves.\textsuperscript{17}

The results of Triana’s research at Arifin Achmad Hospital Pekanbaru in 2012 found that maternal Hb levels < 11 g\% caused IUFD.\textsuperscript{14} Therefore, for recommendations, efforts are needed to make the mother’s Hb during pregnancy more than 11 g\%, namely by increasing the standard of ANC services through the 14 T program, one of which is the administration of Fe tablets. In addition, health workers can motivate pregnant women through counseling to consume lots of food.

4. Relationship of history of comorbidities with pregnancy at risk of obstetric emergency

The results of a bivariate analysis between a history of comorbidities and pregnancies at risk of an obstetric emergency showed that as many as 28 (56\%) mothers who had a history of comorbidities experienced pregnancies at risk for an obstetric emergency. Meanwhile, among mothers who did not have a history of comorbidities, there were 103 (48.8\%) who experienced childbirth complications. The results of the chi-square test obtained p-value
= 0.44 > (0.05), so it can be concluded that there is no relationship between history of comorbidities and pregnancy at risk of obstetric emergency at Koya Barat Health Center.

The prevalence ratio (RP) of medical history to the incidence of childbirth complications at the Koya Barat Health Center is more than 1, which is 1.11 with a 95% CI (0.984-1.739). This means that pregnant women who have a history of comorbidities have a risk of 1.11 times, but it is not significant.

According to the results of Indriyaswari’s research (2019), it is known that the most common comorbidities in pregnancy are Preeclampsia at 81.5%, Anemia (13.4%), Hepatitis (4.5%), and the lowest is DM (0.6%).

High-risk pregnancy is a pregnancy that can threaten the life of the fetus and mother. This requires a more comprehensive approach to high-risk pregnancies, there are categories based on threats to pregnancy health such as biophysical, psychosocial, sociodemographic, and environmental. According to Lowdermik (2013) in Indriyaswari (2019) that pregnancy is at risk of pregnancy complications if it occurs in pregnant women, it can increase perinatal morbidity and mortality. Early detection of high-risk pregnancies is very important in order to identify and prevent problems in pregnancy, and childbirth. During pregnancy, there will be changes in circulation that are influenced by hormones. Increased weight in the mother and the extra tissue needed for the fetus to grow and develop in the womb. According to Jumaiza, Elvira, & Panjaitan (2018) in Indriyaswari (2019) that blood pressure will drop in the first 6 months of pregnancy, this occurs due to a decrease in peripheral vascular resistance caused by stretching of smooth muscles by the hormone progesterone after 24 weeks of pressure blood will rise continuously. This increase occurs along with the enlargement of the uterus and the size of the conceptus. This condition will cause the uptake of oxygen in the uterine blood too much during pregnancy, if the blood flow to the placenta is delayed then the oxygen and nutrients that will be delivered to the fetus will be reduced, so it will slow down the growth and development of the fetus, and increase the risk during childbirth.

5. Relationship of Birth Canal Condition with pregnancy at risk of obstetric emergency

The relationship between birth canal conditions and pregnancies at risk for obstetric emergencies shows that pregnancies with birth canal conditions with complications are likely to have the potential to experience labor complications. Mothers giving birth by birth canal with complications of 56% of pregnancies are at risk of obstetric emergency. The results of the chi-square test obtained p-value = 0.000 (<0.05), it was concluded that there was a significant relationship between the condition of the birth canal and the incidence of labor complications in women giving birth at the Koya Barat Health Center.

The prevalence ratio (PR) of mothers with birth canal conditions with complications to pregnancies at risk for obstetric emergencies at the Koya Barat Health Center is 2.25 with a 95% CI (1.76-2.88). This shows that mothers who give birth with complicated birth canals are at risk of 2.25 times greater risk of having an obstetric emergency risk pregnancy than mothers with normal/uncomplicated birth canals.

The pelvis is the birth canal for the fetus to exit the vagina during the birth process. This is in line with Prawiraharjo who stated that the pelvis is one of the important parts and affects the delivery process. Various pelvic abnormalities can cause labor to last for a long time, including: pelvic deformities such as the type of narrow pelvis, oblique, bone disease, narrow transverse and pelvic size abnormalities both the outer and inner pelvis.

6. The relationship between the condition of the fetus and pregnancy at risk of an obstetric emergency
The relationship between the condition of the fetus and pregnancies at risk for obstetric emergencies shows that women who give birth with a non-headed fetal presentation are most likely to have a pregnancy at risk for obstetric emergencies. Pregnant women with non-head fetus presentation by 87.5% experienced childbirth complications. The results of the Chi-Square test obtained p-value = 0.000 (<0.05), so it was concluded that there was a significant relationship between the condition of the fetus and the incidence of labor complications in women giving birth at the Koya Barat Health Center.

The Prevalence Ratio (PR) of mothers presenting with non-head fetuses to the incidence of childbirth complications at the Koya Barat Health Center is 1.88 with a 95% CI (1.53-2.31). This shows that pregnant women with birth canal conditions with complications have a 1.88 times greater risk of having a pregnancy at risk for obstetric emergencies than mothers with the percentage of the fetus is head.

Based on the results of multivariate logistic regression, the relationship between the condition of the fetus and the incidence of labor complications obtained p-value 0.000 <0.05, meaning that it was significantly proven at the 95% confidence level that there was a significant relationship between the condition of the fetus and maternal labor complications. With a RP value = 82.342, the risk of pregnant women with non-headed presentation of the fetus to experience childbirth complications is quite varied, ranging from 10.3 to 652 times greater than mothers with normal birth canal.

The results of the research by Sari and Absari (2017) also mention that there is a significant relationship between fetal distress and Section Caesarea in the moderate category and having a mother with fetal distress has a 1.358 times risk for a caesarean section compared to mothers without fetal distress. The results of Paat’s research (2015) say that the location, shape of the fetus and birth canal factors are the causes of labor complications (dystocia).

**Conclusion**

1. Education was significantly related to pregnancies at risk for Obstetric Emergency in pregnant women at the Koya Barat Health Center (p < 0.001; RP = 1.72; 95% CI: 1.3-2.1);
2. Age was significantly associated with pregnancies at risk for Obstetric Emergency in pregnant women at Koya Barat Health Center (p < 0.001; RP = 1.98; 95% CI: 1.6-2.4);
3. Parity was significantly associated with pregnancies at risk for Obstetric Emergency in pregnant women at Koya Barat Health Center (p < 0.001; RP = 2.08; 95% CI: 1.68-2.5);
4. HB levels were significantly associated with pregnancies at risk for Obstetric Emergency in pregnant women at Koya Barat Health Center (p = 0.005; RP = 1.44; 95% CI: 1.11-1.83);
5. Birth canal conditions were significantly associated with pregnancies at risk for Obstetric Emergency in pregnant women at Koya Barat Health Center (p < 0.001; RP = 2.25; 95% CI: 1.76-2.88);
6. Fetal condition was significantly associated with pregnancies at risk for Obstetric Emergency in pregnant women at Koya Barat Health Center (p < 0.001; RP = 1.88; 95% CI: 1.53-2.31);
7. History of disease was not significant with pregnancy at risk of Obstetric Emergency in pregnant women at Koya Barat Health Center (p = 0.44; RP = 1.14; 95% CI: 0.86-1.52);
8. The most dominant risk factor for pregnancies at risk for Obstetric Emergency in pregnant women at the Koya Barat Health Center is the state of the fetus (p = 0.001; RP = 13.4 3.507; 95% CI: 3.09 – 58.1).

**Conflict of Interest:** Nil
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Molecular and Classical identification of *Staphylococcus aureus*, Isolated from Iraqi Patients with Recurrent Tonsillitis

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Abstract

Tonsillitis is an infection of the tonsils caused by one of several types of bacteria or viruses. *Staphylococcus aureus* are one of most common bacteria isolated from recurrent tonsillitis, its identification by classical methods takes 3-5 days as well as the accuracy does not reach an absolute degree. So current study aimed to diagnose *S. aureus* by classical and molecular diagnosis to increase the accuracy of the diagnosis. Two hundred and fifteen tonsil swabs were collected from Iraqi patients susceptible suffered from recurrent tonsillitis who attended clinics in major hospitals in Najaf/ Iraq. Classical diagnoses of *S. aureus* were done by bacterial cultures, biochemical test and Vitek system. While molecular diagnosis achieved via PCR technique The results of classical methods showed that 50 isolates recovered from (195) suspected patients were *S. aureus*, while molecular diagnoses showed that 45 isolates out of 50 diagnostic *S. aureus* via classical methods were *S. aureus* with significant difference (P≤ 0.01). In conclusion, Molecular method is more sensitive in diagnoses of *S. aureus* than conventional testes in case of recurrent tonsillitis.

Key words: Classical diagnosis, Molecular diagnosis, PCR, *S. aureus*, Recurrent tonsillitis, Essential genes.

Introduction

Tonsillitis is an inflammatory condition of the tonsils due to bacteria, respiratory viruses, allergies or respiratory problems. *Staphylococcus aureus* is one of the most frequent pathogens in the etiology of recurrent tonsillitis and its relevance is due to its antimicrobial resistance and persistence in the internal tissues of the tonsils. Presence of the beta-lactamase producing *Staphylococcus* in tonsils microbiota can promote penicillin resistance. *Staphylococcus aureus* tonsillitis diagnosed mainly by history and clinical examinations. Superficial tonsillar swabs are often used as a guide in identifying the offending organism and the proper selection of therapy in recurrent tonsillitis¹. Because appropriate treatment for tonsillitis depends on the cause, it’s important to get a prompt and accurate diagnosis. Diagnosis is by either classical examinations as morphological characteristics of gram staining, and culture on media including: blood agar, Mannitol agar, as well as conventional and automated biochemical tests such catalase, coagulase, oxidize and VITEK2 system, additional to molecular diagnosis. Since culturing the bacterium can be difficult, so molecular test is the most accurate. Classical methods are laborious and time consuming taking 3–5 days². The PCR has proven to be an indispensable tool for detection of infectious agents in the laboratory. Essential genes are those genes of an organism that are thought to be critical for its survival. The use of 16S rRNA gene sequences to study bacterial phylogeny and taxonomy has been by far the most common housekeeping genetic marker used for a number of reasons, included its presence in almost all bacteria, often existing as a multigene family, or operons; the function of the 16S rRNA gene over time has not changed, suggesting
that random sequence changes are a more accurate measure of time (evolution); and the 16S rRNA gene is large enough for informatics purposes [3]. The fem A gene is occurring naturally in S. aureus, which is essential for the expression of high-level methicillin resistance [4]. Therefore, in the present study, we tried to diagnose S. aureus with methicillin resistant from recurrent tonsillitis which isolated from Iraqi patients depending on these essential genes by molecular and classical methods.

**Subjects, Materials and Methods**

**Subjects**

Tonsil swabs were collected from (215) patients with recurrent tonsillitis episodes for at least one year, characterized by sore throat or swollen painful tonsils with fever or symptoms of systemic illness, who attended the clinics in major Hospitals in najafe city; AL-Sader Teaching Hospital, al-hakeem, al-sajad Hospital and Center of Public Healthy, from the beginning of October/ 2019 to the end of February / 2020, the age of patients was ranged between (2-60) years with mean age (31) years for both sexes, and (50) samples from apparently healthy persons as a control group.

**Classical diagnoses methods**

Samples were directly inoculated from transport media, on the blood agar and mannitol salt agar at 37 °C for 18-24 hours. After incubation, the isolated colonies were identified by morphological feature, and biochemical tests according to Atlas et al [5]. Single colony of the isolated bacteria was used for direct examination by wet mounted film and gram stained for detection of bacteria. A progression of biochemical tests was performed as catalase, oxidase, coagulase and Vitek 2 test. The antimicrobial susceptibility test had been done by disc diffusion method according to Kirby-Bauer disc diffusion method.

**Estimation of the DNA concentration and purity**

Concentration and purity of the DNA were carried out according to Sambrook and Russell [6], by using Nanodrop (BioNeer /Korea).

**Molecular diagnoses methods**

Genomic DNA extraction form bacterial cells using Gram-Positive Bacteria protocol by genomic DNA purification kit (Bioneer/ Korea). according to Sambrook and Russell [6].

Amplification of essential gene regions by PCR Conventional

Amplification of essential gene regions (16S RNA and femA) by PCR was done by using tow types of specific primers pairs (Table 1) which supplied by Alpha/ Canada, first type for 16SrRNA gene to identification staphylococcus spp., while the second type for the detection femA gene which confirm virulence factor according to Al-musawi et al. [7].

| **Table 1: Sequences and sizes of 16S RNA and femA gene primers.** |
|------------|-----------------|---------|-----------|
| **Target gene** | **Sequence (5’-3’)** | **Tm (°C)** | **Product size** | **Reference** |
| 16S RNA | F 5'-GGTCTTGCTGTCACCTTATAGATGG-3' | 60 | 164 bp | Al-musawi et al., (2014) |
| | R 5'-CGGAAGATTCCCTACTGCTG-3' | | | |
| femA | F 5'-AACAGCTAAAGAGTTTGTTGTC-3' | 60 | 647 bp | |
| | R 5'-CATCAGATGCAAAGCT-3' | | | |
The PCR program carried out according to Sagaidak et al. [8] and (Barzani et al [9] for 16SrRNA and femA genes as clarified in tables (2). Three microliters of PCR products were separated on 2% agarose gel with DNA dye is RedSafe (Intron/ Korea) and a ladder (100bp) (Promega /USA) as visualized in figure (1).

<table>
<thead>
<tr>
<th>gene</th>
<th>Initial denaturation</th>
<th>denaturation</th>
<th>Annealing</th>
<th>Extension</th>
<th>Final extension</th>
<th>Cycle</th>
</tr>
</thead>
<tbody>
<tr>
<td>16 SrRNA</td>
<td>94 °C for 5 min</td>
<td>94 °C for 30 sec</td>
<td>56 °C for 30 sec</td>
<td>72 for 1 min</td>
<td>72 for 5 min</td>
<td>35</td>
</tr>
<tr>
<td>femA</td>
<td>95 °C for 5 min</td>
<td>94 °C for 1 min</td>
<td>60 for 1:30 min</td>
<td>72 for 2 min</td>
<td>72 for 7 min</td>
<td>35</td>
</tr>
</tbody>
</table>

**Results Analysis**

The Statistical Analysis System- SAS[10] program was used to detect the effect of difference factors in study parameters. Least significant difference –LSD test (Analysis of Variation-ANOVA) was used to compare between means and Chi-square test which was used to compare between percentage (0.05 and 0.01 probability).

**Results**

Tonsil swabs of patients suffered from recurrent tonsillitis; bacteria were examined microbiologically. The result showed that 195 (90.69%) samples were positive for bacterial growth recovered from (215), the rest samples 20 (9.30%) showed no bacterial growth, that’s me be due to tonsils can be caused by viruses, fungi, and allergy [16]. On the other hand, 50 (25.64%) samples were positive for S. auerus which was the most prevalent pathogen, while 145(74.36) samples were (Streptococcus pyogenes, Pseudomonas aeruginosa and Klebsiella pneumoniae) formed the remainder percentageas. Colonies of S. aureus were observed after an incubation period of (18-24) hours on blood agar plates, appeared yellow-gray, round, smooth, raised, and some colonies surrounded by a halo or clear zone of β- haemolysis as shown in figure (2), which confirmed the diagnosis as S. aureus according to Leboffe and Pierce[11].

**Figure 1: S. aureus colonies appeared yellow-gray, round, smooth, raised, and some colonies surrounded by a halo or clear zone of β- haemolysis.**

whereas colonies appear on mannitol salt agar surrounded by a yellow halo, this indicated that S. aureus have the ability to ferment mannitol sugar to produce acid in the medium, which leads to
decrease pH and alter the phenol red color from red to yellow. Mannitol salt media contains mannitol carbohydrate that can be used by bacteria as a carbon source, high salt concentration reached to (7.5%) NaCl, and phenol red as a pH indicator, due to the high salt concentration, this media serves to inhibit the growth of the majority of bacterial species, except staphylococci, these results came in accordance to the characteristics mentioned by Mahon et al. [12].

**Antibiotics discs**

(Methicillin, Ampicillin, Amoxillin, Augmentin, Piperacillin, Cloxacillin, Vancomycin, Rifampin, Amikacin, Ciprofloxacin, Tobramycin) by disc diffusion method according to the Kirby-Bauer [13] (Table 3).

<table>
<thead>
<tr>
<th>Antibiotic</th>
<th>Resistance No (%)</th>
<th>Intermediate No (%)</th>
<th>Sensitive No (%)</th>
<th>Total</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Methicillin</td>
<td>45(90%)</td>
<td>5(10%)</td>
<td>0(0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>45(90%)</td>
<td>5(10.0%)</td>
<td>0(0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Amoxillin</td>
<td>42(84.0%)</td>
<td>8(16%)</td>
<td>0(0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Augmentin</td>
<td>39(78.0%)</td>
<td>9(18.0%)</td>
<td>2(4.0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Piperacillin</td>
<td>35(70.0%)</td>
<td>7(14.0%)</td>
<td>8(16.0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Cloxacillin</td>
<td>33(66.0%)</td>
<td>7(14.0%)</td>
<td>10(20.0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Rifampin</td>
<td>22(44.0%)</td>
<td>2(4.0%)</td>
<td>26(52.0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>18(36.0%)</td>
<td>2(4.0%)</td>
<td>30(60.0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>2(4.0%)</td>
<td>3(6.0%)</td>
<td>45(90.0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Amikacin</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>50(100.0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
<tr>
<td>Tobramycin</td>
<td>0(0%)</td>
<td>0(0%)</td>
<td>50(100.0%)</td>
<td>50</td>
<td>0.0001 **</td>
</tr>
</tbody>
</table>

** (P≤0.01).
The present study demonstrates that most S. aureus isolates have high percentage of resistance to Methicillin and Ampicillin. Therefore the isolates considered as MRSA (Methicillin and Ampicillin resistant S. aureus).

Rapid conventional confirmation of S. aureus identification was performed using Vitek2 system its fluorogenic and turbidimetric method. Detection S. aureus isolates in current study gave positive results, where 50 (100%) of suspected S. aureus were confirmed as S. aureus, these results was consistent with reference by Cheebrough\textsuperscript{[13,14]}.

The genomic DNA of S. aureus isolates were extracted by a commercial wizard genomic DNA purification kit, concentration and purity of the DNA were carried out by using Nanodrop. The extracted DNA was analyzed by gel electrophoresis using (2%) agarose gel and DNA Red safe dye, at voltage (70) for (30) minutes. The result showed that purity was good and ranged from (1.8-1.85) and the concentration ranged from (10-12ng/μl), besides the results of gel electrophoresis showed sharp bands of chromosomal DNA as shown in figure (7a,b,c).

Figure 2:
a- Gel electrophoresis of genomic DNA in (2%) agarose gel at (70) volt for (30) min,

b- **Detection of PCR product of 16S RNA gene** (164 bp).

c- **Detection of PCR product of femA gene** (647 bp).

The PCR analysis was employed in this study for amplified essential gene regions (**16Sr RNA** and **femA**) on (1.5%) agarose gel at 70 volts for 45 minute the result of **16S RNA** showed an amplified fragment of (164 bp) as a clear band by electrophoresis as shown in figure (7b). Whereas, the result of amplification **femA** gene was appeared as a clear band of (647 bp) as a clear band by electrophoresis as shown in figure (7c). Results of current figure showed that 50 of sample with percentage 100 % were positive for **16SrRNA** gene, while 45 with percentage 90% were positive for **femA** gene.

**Discussion**

Bacterial culture, microbiological characterization, biochemical tests and are the mainstay of **S. aureus** diagnosis, yet it is only positive in approximately 40–60% of presumptive cases. Various factors contribute to this lack of sensitivity as handling and preserving the sample, validity of used materials, transferring samples, efficiency of laboratory workers, most of the tests are based on experience and personal evaluation [15]. A very common reason for impaired sensitivity is pretreatment with antimicrobials prior to attending a hospital or healthcare facility. Therefore, there is an urgent need to establish reliable high-resolution diagnosis methods for **S. aureus**. The strategy to reduce the time to **S. aureus** diagnosis and increase the sensitivity by a combination of classical and molecular methods [16]. The advantage of such a method is an increase in the speed of a positive confirmatory diagnosis, and to produce a greater level of sensitivity than that of culturing alone.

In present study, (215) tonsils swab collected from individuals susceptible with tonsillitis; (195) samples were positive for bacterial growth. The results of classical diagnosis methods showed that (50) out of 195 (90.69%) were **S. aureus** while molecular diagnoses showed that 45 isolates out of 50 (100%) suspected **S. aureus isolates** which diagnosis via classical methods, little number of bacteria can fail to be detected using culture diagnosis, particularly if the patient has been treated with antibiotics before testing , but with PCR protocol it was able to detect DNA of **S. aureus** in tonsillitis patients even thought in low level.

According to the results of Amoxillin and Augmentin, the interpretation of this result may be due to that these antibiotics are widespread use for treatment of **Staphylococcal** infections in Najaf province and in whole of Iraq, what explains the resistance of isolates to these antibiotics. The detection of MRSA is an important mater for patients care and infection control committee. Globally many previous studies agreed with present study as search of Thomas [17] found that more than (90%) of **S. aureus** was MRSA of the core culture of tonsils in patients with recurrent and chronic tonsillitis. Brook et al. [18], found MRSA at the period (2004-2006) from acute and chronic sinusitis. But the results of present study disagree with Mathew, [9] found (33.3%) of **S. aureus** from core and surface of infected tonsils were MRSA, the **16SrRNA** gene are responsible for diagnosis **Staphylococcus genus**, so this study employed PCR to detect**16SrRNA** gene for identifying and confirmed all the staphylococcal isolates as **S. aureus**. Several studies have used this method for more rapidly and reliably. The results of current study agree with result of a same study in Iran reported by[18] who noticed that amplification of 16s rRNA confirmed all the (126) **staphylococcal** isolates that involved in the study as **S. aureus**. Several studies have reported the use of **femA** as marker for detection of methicillin resistance.
However, femA alone does not solely confer the methicillin resistance. Studies have shown that fem (factors essential for methicillin resistance) or the auxiliary genes like fem A/B/X in addition to mecA are also important in the expression of methicillin resistance [11].

Although the detection of femA gene remains the gold standard for detecting methicillin resistance, its detection alone does not confirm the presence of S. aureus and there is no consensus on the molecular target that could be used to confirm the S. aureus species. Constitutively expressed genes such as femA and femB are being used as molecular targets for the identification of S. aureus species. Therefore, the current study relied on a combination of two genes (16SrRNA and femA) to diagnose S. aureus. During screening for methicillin resistance markers in clinical isolates, it was observed all tested isolates were positive for the genus specific fem A (647bp). The results of recent study agreed with [2] who found all of the (176) samples which tested contained the fem A gene. However, the results of current study disagreed with [3] when found femA PCR out of the 54(29.6%) isolates in the detection of S. aureus where it showed that polymorphisms in femA gene sequences are present in MRSA isolates in India and requires further investigations such as sequencing to characterizes the genome in general and femA in particular.

**Conclusion**

It can be concluded that the molecular methods are more sensitive in diagnoses of S. aureus than classical tests in case of tonsillitis in Iraqi sample.

**Conflict of Interest:** None

**Funding:** Self

**Ethical Clearance:** Not required

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Accuracy Analysis of Various Blood Pressure Measurement Methods by 119 Paramedics

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Abstract

Background/Objectives: This study is to confirm the accuracy of various blood pressure measurement methods by 119 paramedics.

Methods/Statistical analysis: This study evaluated the accuracy of blood pressure measurement and the confidence of blood pressure measurement in stable, stable and noisy, driving, and driving noise situations for 40 119 paramedics. The collected data were analysed with SPSS 22.0 using frequency, descriptive statistics, and paired t-test.

Findings: The confidence of blood pressure measurement was significantly higher in four situations after education. In blood pressure measurement accuracy, there was the significant difference in the following situations: Stable noisy and driving noisy in normal blood pressure ($t=-2.823$, $p=.007$). Stable driving, stable noisy ($t=-2.191$, $p=.034$), and driving noisy ($t=-2.421$, $p=.020$) in hypertension. Stable driving, stable noisy ($t=-3.674$, $p=.001$), and driving noisy ($t=-2.095$, $p=.043$) in hypotension. In the accuracy of blood pressure measurement by palpation, there was the significant difference in stable and driving situation under hypotension ($t=-2.211$, $p=.033$).

Improvements/Applications: The education on blood pressure measurement in various environments is necessary to improve the measurement accuracy of 119 emergency personnel.

Keywords: Blood Pressure, Paramedics, Measurement, Accuracy, Confidence

Introduction

The emergency medical system is largely divided into the pre-hospital stage and the hospital stage[1]. The pre-hospital stage includes patient rescue and transfer, patient evaluation and treatment, and severity classification, and the treatment of paramedics has the important influence on patient’s prognosis[2]. In addition, the number of 119 paramedics who perform most of the first-aid and transfer tasks for patients at the pre-hospital stage is steadily increasing every year[3].

The scope of work of first-class emergency medical personnel includes not only tasks such as CPR implementation in accordance with Article 33 of the Enforcement Rule of the Emergency Medical Act, but also the measurement of vital signs that are

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basically performed for evaluation and treatment of emergency patients. Vital sign is the most basic evaluation of a patient’s clinical condition, an index that can predict the prognosis, and is an essential element for patient evaluation at the pre-hospital stage. In addition, the measurement of patient’s vital sign at the pre-hospital stage is an essential factor in patient evaluation[2], and it is the fourth most frequent emergency treatment performed by 119 paramedics, and should be accurately measured because it is related to human life[4]. Among vital signs, blood pressure is a physiological variable that not only reflects the patient’s hemodynamic factors, but also predicts the patient’s current state and future state changes[5].

Blood pressure measurement of emergency patients must be performed in the stable situation for high accuracy. But various, unpredictable and dangerous situations can occur at the site before the hospital. However, the field of paramedics at the pre-hospital stage varies from mild to severe patients, diseases and trauma, and dangerous situations that paramedics cannot predict may occur. In addition, blood pressure is often measured in unstable situations due to various disturbing factors such as people, vibration and noise. For this reason, it is very difficult to accurately measure blood pressure in various pre-hospital sites and ambulances where vibration and noise are generated[6]. Moreover, 119 paramedics are measuring blood pressure using auscultation, palpation, and automatic sphygmomanometer to determine the patient’s condition[5]... However, blood pressure that cannot be accurately measured has the risk of providing unnecessary or inappropriate treatment by erroneously judging the patient’s condition, so accurate measurement of blood pressure is important for grasping the patient’s condition[7,8].

Most of the preceding studies related to blood pressure measurement are the thesis evaluating the knowledge and practice of blood pressure measurement for nurses and nursing students, or evaluating the knowledge and accuracy of blood pressure measurement of trainees and emergency rescue students[9-11]. In the results of previous studies involving 119 paramedics, palpation was the most preferred method of measuring blood pressure(64.5%), and the accuracy of blood pressure measurement was measured by auscultation[5]. However, there has been no previous study confirming the accuracy of blood pressure measurement including the effect of noise in various situations considering the work characteristics of 119 paramedics.

Therefore, this study was attempted to provide the essential basic data for the development of blood pressure measurement guidelines and practical training programs to improve the quality of emergency medical services provided by 119 paramedics at all hospital sites by confirming the accuracy of various blood pressure measurement methods including the noise in the safe and driving situations of 119 paramedics.

**Method**

2.1. Research design

This study is the one-shot case experimental study attempted to confirm the accuracy of various blood pressure measurements for 119 paramedics.

2.2. Research subjects and sampling method

The subjects of this study were 119 paramedics from two fire departments located in J city and agreed to participate in the study. The number of study subjects was calculated as 34 when the significance level(α) was set to .05, the power(1-β) to .95, and the effect size to .50 using G*Power 3.1.9. 40 people were selected in consideration of the dropout rate, and 40 people were included in total.
2.3. Research tools

2.3.1 The accuracy of blood pressure measurement under stable conditions

Blood pressure in a stable situation was measured using the blood pressure measuring simulator BT-CEAB2 (BT, Wonju) on a mat laid in the practice room under the assumption that the patient is lying down. As for the blood pressure measurement method, normal blood pressure, hypertension, and hypotension randomly designated by the researcher were measured by auscultation and palpation, and blood pressure measurement values were reported to the last digit. The auscultation method was utilized in brachial artery using the stethoscope while the palpation method was measured in the pulse of radial artery. The accuracy of blood pressure measurement accuracy in the stable situation means the difference between three blood pressure values set by the researcher and the subject’s measurement value. The lower the score, the higher the blood pressure measurement accuracy.

2.3.2 The accuracy of blood pressure measurement in stable and noisy situations(90dB)

Blood pressure measurement in stable and noisy conditions was attempted at 90dB in accordance with the 「Rules on the Performance and Standards of Automobiles and Automobile Parts」, and The method of blood pressure measurement using auscultation with palpation was tried in the same way as the accuracy of blood pressure measurement in the stable situation. The accuracy of blood pressure measurement accuracy in stable and noisy situations(90dB) refers to the difference between the three blood pressure values arbitrarily set by the researcher and the subject’s measurement value. The lower the score, the higher the blood pressure measurement accuracy.

2.3.3 The accuracy of blood pressure measurement in driving situations

The accuracy of blood pressure measurement in the driving situation means that it is calculated by traveling at the speed of 60km/h in 3km section in accordance with the Road Traffic Act, and the blood pressure measurement method using auscultation with palpation was tried in the same way as the blood pressure measurement accuracy in the stable situation. The accuracy of blood pressure measurement in driving situations means the difference between the three blood pressure values set by the researcher and the subject’s measurement values, and the lower the score, the higher the blood pressure measurement accuracy.

2.3.4 The accuracy of blood pressure measurement in driving and noisy situations(90dB)

Blood pressure measurement in a driving and noisy situation(90dB) means calculating the blood pressure in 90dB siren noise situation in addition to the driving situation at the speed of 60km/h over 3km section. The blood pressure measurement method using auscultation with palpation was performed in the same way as the accuracy of blood pressure measurement in the stable situation. The accuracy of blood pressure measurement in driving with noisy conditions means the difference between three blood pressure values set by the researcher and the subject’s measurement values, and the lower the score, the higher the blood pressure measurement accuracy.

2.3.5 The confidence of blood pressure measurement

The blood pressure measurement confidence means each blood pressure measurement confidence using auscultation with palpation in stable and driving situations. It was measured on the NRS 0-10 Likert scale, and the higher the score, the higher the performance confidence.
2.4. Data collection

The 119 paramedics working at the J city fire department for the study were given an explanation of the purpose, method, duration, expected effects, interests and possible problems of participation, and refusal to participate, including guaranteeing anonymity. Then, consent was submitted and the study was conducted. The study period was from July 22 to July 23, 2020.

2.5. Data analysis

The SPSS WINDOW 22.0 Program was used to analyze the collected data. The frequency and descriptive statistics were used to determine the general characteristics of the subject as well as the accuracy and confidence level of blood pressure measurement in four situations before and after education. The test for the difference between blood pressure measurement accuracy and confidence in four situations before and after training was analyzed by paired t-test.

Results

3.1. General characteristics of subjects

As for general characteristics of the subjects, the preferred method among gender, age, experience of 119 paramedics, clinical work experience, clinical work period, and blood pressure measurement method was investigated, and the analysis results are shown in Table 1. In terms of gender, there were 25(62.0%) women, the most common age was less than 25-30 years old, and the average age was 29.05 years. The most frequent experience of paramedics was less than 1-5 years (45.0%), and the average experience was 32.55 months. 27 (67.5%) had clinical work experience, and 12 (44.4%) had a clinical work period of less than 1-3 years. The most common blood pressure measurement method was performed by palpation in the radial artery in 30 patients (75.0%) (Table 1).

3.2. Comparison of the accuracy and difference in blood pressure measurement in four situations

The degree and the difference in the accuracy of blood pressure measurement in the four situations are shown in Table 2. There was no statistically significant difference in blood pressure measurement accuracy measured by auscultation between stable and driving conditions (t=-1.695, p=.098) at randomly set normal blood pressure. However, there was a statistically significant difference between stable noisy and driving noisy situation (t=-2.823, p=.007). In hypertension, there was a statistically significant difference between stable and running situation (t=-2.191, p=.034), and between stable noisy and running noisy situations (t=-2.421, p=.020). In hypotension, there was a statistically significant difference when comparing stable situation with driving one (t=-3.674, p=.001), stable noisy situation with driving noisy one (t=-2.905, p=.043). In the accuracy of blood pressure measurement by palpation, there was a statistically significant difference between stable and driving situation (t=-2.211, p=.033) (Table 2).
Table 1. General Characteristics of Subjects (N=40)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Categories</th>
<th>N(%)</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Male</td>
<td>15(37.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>25(62.5)</td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>&lt;20-25</td>
<td>3(7.5)</td>
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<tr>
<td></td>
<td>&lt;25-30</td>
<td>24(60.0)</td>
<td>29.05±4.27 (months)</td>
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<tr>
<td></td>
<td>&lt;30-35</td>
<td>9(22.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥35</td>
<td>4(10.0)</td>
<td></td>
</tr>
<tr>
<td>Paramedic career (year)</td>
<td>&lt;1</td>
<td>14(35.0)</td>
<td>32.55±43.58 (months)</td>
</tr>
<tr>
<td></td>
<td>&lt;1-5</td>
<td>18(45.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>&lt;5-10</td>
<td>6(15.0)</td>
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</tr>
<tr>
<td></td>
<td>≥10</td>
<td>2(5.0)</td>
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<tr>
<td>Clinical work experience</td>
<td>Yes</td>
<td>27(67.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>13(32.5)</td>
<td></td>
</tr>
<tr>
<td>Clinical work period</td>
<td>&lt;1</td>
<td>1(3.7)</td>
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<tr>
<td></td>
<td>&lt;1-3</td>
<td>12(44.4)</td>
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<td></td>
<td>&lt;3-5</td>
<td>9(33.3)</td>
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<td></td>
<td>≥5</td>
<td>5(18.5)</td>
<td></td>
</tr>
<tr>
<td>Blood pressure Measurement method</td>
<td>Stethoscope</td>
<td>3(7.5)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Palpation (radial)</td>
<td>30(75.0)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NIBP</td>
<td>7(17.5)</td>
<td></td>
</tr>
</tbody>
</table>
3.3. Comparison of the level and the difference of blood pressure measurement confidence in four situations before and after training

Table 3 shows the level and the difference of blood pressure measurement confidence in the four situations. In a stable situation, the confidence in blood pressure measurement through auscultation was 7.70 points before education and 8.18 points after education, but there was no statistically significant difference(t=-1.512, p=.139). However, in the stable situation before and after education, there was a statistically significant difference in the confidence through palpation(t=-3.275, p=.002), auscultation in stable noisy situation(t=-4.106, p<.001), palpation in stable noisy situation(t=-5.414, p <.001), auscultation in driving situation(t=-4.452, p <.001), palpation in driving situation(t=-5.985, p<.001), auscultation in driving noisy situation(t=-5.194, p<.001), and palpation in driving noisy situation(t=-6.696, <.001) (table 3).

**Table 2. Comparison of The Accuracy and The Difference of Blood Pressure Measurement in Four Situations (N=40)**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Mean±SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Auscultation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal BP</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td>4.50±3.26</td>
<td>-1.695</td>
<td>.098</td>
</tr>
<tr>
<td>Driving</td>
<td>6.81±7.63</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable+Noisy</td>
<td>4.62±4.02</td>
<td>-2.823</td>
<td>.007</td>
</tr>
<tr>
<td>Driving+Noisy</td>
<td>8.12±6.71</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypertension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td>6.37±7.16</td>
<td>-2.191</td>
<td>.034</td>
</tr>
<tr>
<td>Driving</td>
<td>11.06±10.58</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable+Noisy</td>
<td>6.37±7.16</td>
<td>-2.421</td>
<td>.020</td>
</tr>
<tr>
<td>Driving+Noisy</td>
<td>9.81±7.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hypotension</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td>3.12±2.45</td>
<td>-3.674</td>
<td>.001</td>
</tr>
<tr>
<td>Driving</td>
<td>6.87±5.53</td>
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<td></td>
</tr>
<tr>
<td>Stable+Noisy</td>
<td>4.00±3.87</td>
<td>-2.095</td>
<td>.043</td>
</tr>
<tr>
<td>Driving+Noisy</td>
<td>6.32±7.01</td>
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<td></td>
</tr>
<tr>
<td><strong>Palpation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal BP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stable</td>
<td>3.38±4.29</td>
<td>-0.154</td>
<td>.878</td>
</tr>
<tr>
<td>Driving</td>
<td>3.50±3.95</td>
<td></td>
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</tr>
<tr>
<td>Stable+Noisy</td>
<td>2.63±4.08</td>
<td>-1.629</td>
<td>.111</td>
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<tr>
<td>Driving+Noisy</td>
<td>3.50±5.57</td>
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<td></td>
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<tr>
<td>Hypertension</td>
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<tr>
<td>Stable</td>
<td>3.38±4.58</td>
<td>-1.246</td>
<td>.220</td>
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<tr>
<td>Driving</td>
<td>6.00±9.28</td>
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<tr>
<td>Stable+Noisy</td>
<td>3.50±4.41</td>
<td>-0.706</td>
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<tr>
<td>Driving+Noisy</td>
<td>5.88±7.06</td>
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<td></td>
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<tr>
<td>Hypotension</td>
<td></td>
<td></td>
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<tr>
<td>Stable</td>
<td>3.25±5.00</td>
<td>-2.211</td>
<td>.033</td>
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<tr>
<td>Driving</td>
<td>4.63±4.98</td>
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<td>Stable+Noisy</td>
<td>2.88±3.18</td>
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<tr>
<td>Characteristics</td>
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<td>After training</td>
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<td>-----------------------------------------------------</td>
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<td>----------------</td>
<td>-------</td>
</tr>
<tr>
<td></td>
<td>Mean±SD</td>
<td>Mean±SD</td>
<td></td>
</tr>
<tr>
<td>Stable situation confidence in BP measurement</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Auscultation</td>
<td>7.70±1.78</td>
<td>8.18±1.83</td>
<td>-1.512</td>
</tr>
<tr>
<td>Palpation</td>
<td>7.80±1.45</td>
<td>8.65±1.52</td>
<td>-3.275</td>
</tr>
<tr>
<td>Stable noisy situation confidence in BP measurement</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auscultation</td>
<td>6.35±1.64</td>
<td>7.65±2.00</td>
<td>-4.106</td>
</tr>
<tr>
<td>Palpation</td>
<td>6.90±1.53</td>
<td>8.35±1.56</td>
<td>-5.414</td>
</tr>
<tr>
<td>Driving situation confidence in BP measurement</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Auscultation</td>
<td>6.28±1.60</td>
<td>7.95±2.23</td>
<td>-4.452</td>
</tr>
<tr>
<td>Palpation</td>
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<td>8.48±1.56</td>
<td>-5.982</td>
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<tr>
<td>Driving noisy situation confidence in BP measurement</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Auscultation</td>
<td>5.88±1.78</td>
<td>7.83±2.14</td>
<td>-5.194</td>
</tr>
<tr>
<td>Palpation</td>
<td>6.53±1.45</td>
<td>8.43±1.53</td>
<td>-6.696</td>
</tr>
</tbody>
</table>

**Discussion**

In order to provide accurate first aid to patients at the pre-hospital stage, the patient’s condition must be accurately determined. There are vital signs as a basic factor that can determine the patient’s condition, among which blood pressure reflects the patient’s basic condition. However, the emergency situations at pre-hospital stage are very diverse and unpredictable, and because there are many disturbing factors around the patients, it is difficult to accurately measure blood pressure, so education to measure blood pressure in various situations is required. Therefore, in this study, it was attempted to provide the basic data for educational program development by checking the accuracy of measurement in four situations of blood pressure measurement targeting 119 paramedics.

As a result of the study, there was no statistically significant difference between the accuracy of blood pressure measurement in stable conditions and the one during driving, measured with the stethoscope. However, the accuracy error range of blood pressure measurement in stable conditions was 4.50mmHg on average, and blood pressure measurement accuracy during driving was 6.81mmHg, confirming that blood pressure measurement is more difficult in driving conditions than in stable conditions. This is the result supporting the previous study\textsuperscript{[5]} showing an error range of 4.79mmHg in stable conditions and 6.72mmHg in driving conditions in the blood pressure measurement accuracy for 119 paramedics. In addition, this result supports the result of a study\textsuperscript{[12]} that the accuracy of blood pressure measurement in an ambulance driving with severe vibration is more variable than in stable situation. In addition, there was a statistically significant difference in blood pressure measurement accuracy in stable noisy and driving...
noisy situations. And the accuracy error range of blood pressure measurement was the largest at 8.12mmHg in the driving noisy situation. In hypertension and hypotension, as with normal blood pressure, the one of blood pressure measurement was large in driving or noisy situation. This result was similar to the one of a study that compared the accuracy of systolic blood pressure measurement in normal blood pressure with the one in hypertensive conditions, and showed the large error range of blood pressure measurement accuracy in hypertension[13]. Therefore, it is necessary to provide various experience and education to the students of related departments to accurately measure the blood pressure, which is the basic data for grasping the patient’s condition, and to develop the various practice training programs of blood pressure measurement that take into account the work characteristics of 119 paramedics.

As measured by palpation, under normal blood pressure, stable driving, stable noisy and driving noisy situation; under high blood pressure, stable noisy, stable noisy and driving noisy situation; in hypotension, stable noisy situation, driving noisy situation showed no significant difference in the accuracy of blood pressure measurement. This was different from the results of previous studies[5] that confirmed the accuracy of blood pressure measurement in stable and driving situations. These results support the results of the study that 119 paramedics could measure most accurately because palpation was their most preferred method of measuring blood pressure[11]. However, in order to accurately measure systolic and diastolic blood pressure, it is necessary to measure blood pressure using the stethoscope, so the experience of repeatedly measuring blood pressure with stethoscope in various situations is required. In addition, when evaluating the patient at the site prior to the hospital, based on the results of blood pressure measurement, the classification of patient’s severity and rapid transfer are determined, and appropriate emergency managements are taken[11]. So the method of accurate blood pressure measurement should be emphasized.

In the results of the level of confidence in blood pressure measurement in four situations before and after education, in stable situation, the confidence in blood pressure determined by auscultation didn’t show a significant difference before and after education. But in the stable situation, the confidence in blood pressure measurement by palpation was improved after education. This result is believed to be because the education of blood pressure measurement in stable situation is also repeated and generalized in universities and fire departments. The confidence in blood pressure measurement with auscultation or palpation methods in stable noisy, driving and driving noisy situations has improved statistically significantly after training compared to the one before training, which is believed to be the educational effect of how to measure blood pressure in new situations. Since the confidence in blood pressure measurement is correlated with the accuracy of blood pressure measurement[14], the repeated education is necessary to improve the confidence in various situations.

**Conclusion**

This study attempted to confirm the accuracy of blood pressure measurements performed by 119 paramedics in various situations. As a result of the study, after training, the confidence of blood pressure measurement in various situations improved, and the accuracy of blood pressure measurement was lower in driving and noisy situations than in stable situations. These results are meaningful in verifying that the education of blood pressure measurement in various environments should be emphasized on 119 paramedics for the efficient clinical evaluation of patient and treatment in various field situations. Therefore, in addition to blood pressure measurement in the secure environment, the follow-up study can be
recommended to confirm the effect after developing and applying the educational program for blood pressure measurement of 119 paramedics in various situations. Furthermore, it is suggested that this program should be reflected in practical education for the students in Department of Emergency Rescue.

**Limitations:** This study considered only paramedics in two fire department and may not represent all paramedics.

**Ethical Clearance:** For ethical consideration of the study subjects, data was collected after approval through the deliberation (IRB No: D **-2020-01-001-01) of Institutional Review Board (IRB) of D university. The informed consent was obtained from the subjects before data collection. Confidentiality of data collected was ensured.

**Source of Funding:** The paper was support by the Daewon University College Research Grant of 2020.

**Conflict of Interest:** Nothing specific—can use the study findings with proper citation of authors name.

**References**

11. Choi ES. Accuracy of blood pressure measurements


High Neutrophil to Lymphocyte Ratio, C-Reactive Protein, Procalcitonin and D-dimer as Risk Factors for Severe COVID-19


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Abstract

Background: COVID-19 is caused by the SARS-CoV2 virus which is a new type of virus that causes global morbidity and mortality. Several studies are needed to determine biomarkers to identify the severity of COVID-19. Objective: to analyze the correlation between Neutrophil to lymphocyte rate (NLR), C-Reactive Protein (CRP), D-dimer, and Procalcitonin (PCT) on the severity of COVID-19. Method: A retrospective case-control study was done in our institution using data from June 2020 to March 2021. Data collected were serum NLR, CRP, d-dimer, and PCT. Data were analysed using SPSS. Participants were divided into 2 groups, severe COVID-19 as case and mild to moderate as control group. The data collection was carried out in June 2020 – March 2021, included NLR, CRP, D-dimer, and PCT in patient serum. Data analysis using Chi-Square test and logistic regression with p < 0.05.

Result: The NLR value of participants in case group is 11.4 ± 9.7 and in control group is 8.2 ± 8.5 (95% CI 1.081 – 4.641; p = 0.023). The PCT value of participants in case group was 10.3 ± 75.4 and in control group was 6.9 ± 41.4 (95% CI 1.495 – 6.908; p < 0.001). CRP values in case group (123.7 ± 108.9) were higher than control group (61.3 ± 60.8; 95% CI 1.181 – 5.063; p < 0.001). Meanwhile, the value of D-dimer participants in case group was 3.5 ± 3.7 and control group was 2.7 ± 4.6 (95% CI 0.604 – 2.958; p = 0.473). Conclusion: increased values of NLR, CRP, and D-dimer are risk factors for severe COVID-19.

Keyword: Neutrophil to Lymphocyte Ratio, C-Reactive Protein, D-dimer, Procalcitonin, the severity of COVID-19

Introduction

Acute respiratory infections caused by viruses are one of the leading causes of morbidity and mortality globally. The World Health Organization (WHO), China Country Office reported a case of pneumonia of unknown etiology in the city of Wuhan, Hubei province, China called COVID-19(1). Clinical symptoms experienced by patients vary widely from asymptomatic to signs of respiratory failure. The severity of the COVID-19 disease is an important concern in handling the disease. Patients with severe COVID-19 have symptoms of respiratory failure and require mechanical ventilation and intensive care unit (ICU) care with a mortality rate of 50-60%. This is the basis for the importance of evaluating risk factors that...
The development of biomarker examinations for lung disease in the world has helped a lot in determining the severity of the disease. Research conducted in China on risk factors that influence the severity of COVID-19 shows that D-dimer examination is a risk factor for the severity of COVID-19 disease and patient prognosis. In addition, inflammatory markers such as C-Reactive Protein (CRP), Procalcitonin (PCT), Neutrophil to Lymphocyte Ratio (NLR), can affect the severity of COVID-19. NLR is an inflammatory biomarker that can be used as an indicator of the systemic inflammatory process. These biomarkers were determined by dividing the absolute neutrophil and absolute lymphocyte counts. Elevated NLR may serve as a risk and prognostic factor for the severity of COVID-19. Meanwhile, CRP is a protein produced by the liver in the context of inflammation in the body. Patients with CRP >41.8 mg/L can lead to a severe inflammatory process and worsen the degree of COVID-19.

PCT is an examination related to bacterial infection where this examination can show the presence of bacterial infection and severe viral infection. So, this examination can play a role in determining the severity of COVID-19. D-dimer is a blood coagulation marker in COVID-19 patients that is used to monitor co-occurring diseases that are the cause of the increasing mortality rate of COVID-19. D-dimer levels above 1.0 g/mL are associated with patient mortality.

Several studies conducted in various countries showed an association between PCT, CRP, NLR, and D-dimer in determining mortality in COVID-19 patients. This is the basis for researchers to examine the examination of biomarkers NLR, CRP, D-dimer, and PCT as risk factors for the severity of COVID-19 disease. The purpose of this study is to analyse the inflammatory and coagulation processes that occur and determine the risk factors for the severity of COVID-19.

Method

Participant

Participants in this study were patients who had SARS-CoV2 virus infection confirmed by an RT-PCR swab in the oronasopharynx. Participant inclusion criteria include COVID-19 patients, aged >18 years, and COVID-19 patients hospitalized until they were allowed to go home or die. Participant with incomplete data was excluded from this study.

Design Study

A retrospective case-control study was done in Sanglah General Hospital. This research was conducted in the period June 2020 to March 2021. The number of participants in this study was 180 participants and divided into 2 groups (case group = COVID-19 with severe degrees and control group = COVID-19 with moderate-mild degrees). Data collected were age, length of stay, the severity of COVID-19 at hospital admission, PCT levels, CRP levels, D-dimer levels, and NLR ratio. NLR ratio is the absolute number of neutrophils compared to the absolute number of lymphocytes obtained from the patient’s complete blood count. Levels of CRP was obtained from the patient’s blood with standard CRP test. Procalcitonin is a precursor level of the hormone calcitonin D which is physiologically synthesized by the C cells of the thyroid gland. D-dimer epitope levels in the D-dimer fragment using the Enzyme-Linked Immunosorbent Assay (ELISA) examination method from the patient’s blood.

Statistical Analysis

The data in this study were first tested for normality using the Kolmogorov Smirnov test. This analysis was assisted using IBM SPSS Statistics software version 21.0 (IBM Corp., Armonk, NY,
USA). The statistical test used in this study used the Chi-Square test and logistic regression with \( p < 0.05 \).

**Result**

**Characteristic of Participant**

Most of the participants were male with a total of 117 people and 65% of the samples (\( p = 0.160 \)). The mean age of the participants was 54.41 ± 14.17 years. Some participants recovered and returned alive, of which 63% were severe participants and 86% were non-severe participants (\( p = 0.002 \)). Some participants had comorbid diseases including diabetes mellitus (18% vs 13%; \( p = 0.411 \)), heart defects (21% vs 6%; \( p = 0.022 \)), and kidney disorders (17% vs 9%; \( p = 0.037 \); table 1).

**NLR, CRP, D-dimer, and PCT as risk factors for the severity of COVID-19**

The NLR value of participants in case group was 11.4 ± 9.7 and in control group it was 8.2 ± 8.5 (95% CI 1.081 – 4.641; \( p = 0.023 \)). The PCT value of participants in case group was 10.3 ± 75.4 and in control group was 6.9 ± 41.4 (95% CI 1.495 – 6.908; \( p < 0.001 \)). CRP values in case group (123.7 ± 108.9) were higher than control group (61.3 ± 60.8; 95% CI 1.181 – 5.063; \( p < 0.001 \)). Meanwhile, the D-dimer value of participants in case group was 3.5 ± 3.7 and control group was 2.7 ± 4.6 (95% CI 0.604 – 2.958; \( p = 0.473 \); table 2).

**Combination of NLR, CRP, D-dimer, and PCT as a Risk Factor for Severity of COVID-19**

Based on the results of multivariable analysis, it was found that 4 variables that have a significant impact on the severity of COVID-19 are NLR, CRP, D-dimer, and heart defects. Then, multiple logistic regression analysis was performed to obtain the adjusted odds ratio (table 3). Based on the results of the chi-square analysis, the sensitivity of the scoring system was 78.9% with a specificity of 60%. These results suggested that the combination of NLR with CRP, or with D-dimer and cardiac abnormalities may be a risk factor for the severe COVID-19.

<table>
<thead>
<tr>
<th>Variable</th>
<th>COVID-19 Degree</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe (%)</td>
<td>Mild to moderate (%)</td>
</tr>
<tr>
<td></td>
<td>n = 90</td>
<td>n = 90</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Man</td>
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<td>54 (60)</td>
</tr>
<tr>
<td>Woman</td>
<td>27 (30)</td>
<td>36 (40)</td>
</tr>
<tr>
<td>Heart defects</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>19 (21)</td>
<td>6 (6)</td>
</tr>
<tr>
<td>Not</td>
<td>71 (79)</td>
<td>84 (94)</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>16 (18)</td>
<td>12 (13)</td>
</tr>
<tr>
<td>Not</td>
<td>74 (82)</td>
<td>78 (87)</td>
</tr>
<tr>
<td>Patient Dies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Die</td>
<td>33 (37)</td>
<td>15 (17)</td>
</tr>
<tr>
<td>Come back alive</td>
<td>57 (63)</td>
<td>75 (83)</td>
</tr>
<tr>
<td>Kidney disorders</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>15 (17)</td>
<td>8 (9)</td>
</tr>
<tr>
<td>Not</td>
<td>75 (83)</td>
<td>82 (91)</td>
</tr>
</tbody>
</table>

Table 1. Characteristics of participants
Table 2. Analysis of risk factors for NLR, CRP, D-dimer and Procalcitonin on the degree of COVID-19

<table>
<thead>
<tr>
<th>variable</th>
<th>COVID-19 Degree</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Severe</td>
<td>Mild to moderate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NLR</td>
<td>11.4±9.7</td>
<td>8.2±8.5</td>
<td>2.240</td>
<td>1.081 – 4.641</td>
</tr>
<tr>
<td>Procalcitonin</td>
<td>10.3±75.4</td>
<td>6.9±41.4</td>
<td>3.214</td>
<td>1.495 – 6.908</td>
</tr>
<tr>
<td>CRP</td>
<td>123.7±108.9</td>
<td>61.3±60.8</td>
<td>2.550</td>
<td>1.181 – 5.063</td>
</tr>
<tr>
<td>D-Dimer</td>
<td>3.5±3.7</td>
<td>2.7±4.6</td>
<td>1.337</td>
<td>0.604 – 2.958</td>
</tr>
</tbody>
</table>

Table 3. Analysis of multivariate risk factors for severe COVID-19

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>NLR</td>
<td>2.360</td>
<td>1.176 – 4.738</td>
<td>0.016 *</td>
</tr>
<tr>
<td>CRP</td>
<td>3.432</td>
<td>1.665 – 7.073</td>
<td>0.001 *</td>
</tr>
<tr>
<td>D-dimer</td>
<td>2.804</td>
<td>1.404 – 5.060</td>
<td>0.003 *</td>
</tr>
<tr>
<td>Heart defects</td>
<td>5.325</td>
<td>1.767 – 16.046</td>
<td>0.003 *</td>
</tr>
</tbody>
</table>

Discussion

Neutrophyl to Lymphocite Ratio is a marker of inflammatory processes that occur in the body. Several studies stated that NLR levels were significantly different between the severe and mild to moderate COVID-19 groups\(^6\). Other studies have also stated high levels of NLR as a prognostic marker that affects the worsening of COVID-19\(^8\). Previous studies have also shown a positive correlation between NLR and severe COVID-19\(^9\). The NLR levels were found to be elevated in viral infections such as influenza, coronavirus, and rhinovirus. The NLR levels are elevated in patients with severe SARS-CoV2 virus infection. The higher the NLR level, the more severe the inflammation that occurs in the patient\(^6, 8, 9\). The results of this studies were connected with previous studies which stated that there was a significant difference between severe and non-severe COVID-19 groups\(^6\). C-Reactive protein is one of the markers of inflammation that increases when there is exposure to microbes or irritating substances. High CRP levels (> 20.44) in plasma are associated with the severity of COVID-19\(^10\). High CRP levels are associated with severity, Deep Vein Trombosis (DVT), renal impairment, and death in COVID-19\(^11\). The CRP levels as a marker of the inflammatory response is associated with the severity of COVID-19\(^12\). High CRP levels are a marker of an acute inflammation that occurs in the body. Level of CRP were found to be elevated in viral infections such as influenza, coronavirus, and rhinovirus. CRP levels are elevated in patients with severe SARS-CoV2 virus infection. The increase in CRP levels, the more severe the inflammation that occurs in the patient\(^6, 10\). This result is different with the results of previous studies.
where PCT levels between severe and non-severe COVID-19 were significantly different. This is because PCT is increased in severe viral infections. PCT is an increased investigation specific for bacterial infections. However, several studies have shown an increase in PCT levels in patients with severe viral infections\(^6\). A meta-analysis study stated that PCT levels were not associated with the need for intensive care, so PCT levels were not yet a risk factor for severe COVID-19. Thus, it is necessary to conduct further research involving samples in >2 different treatment sites\(^{13}\).

We found that there are significant differences in D-dimer, which also found in a previous study where D-dimer values increased in COVID-19 patients\(^{14}\). D-dimer levels in severe COVID-19 patients were significantly different from non-severe COVID-19. This is due to an increase in thrombosis due to the high inflammation caused by SARS-CoV2 virus infection in the lungs\(^{15}\). The likelihood of severe COVID-19 is associated with D-dimer levels >0.5 g/ml\(^{14,15}\). The level of D-dimer is a marker of fibrin formation in the body of COVID-19 patients in the early phase. This could be because infection with the SARS-CoV2 virus can cause an increase in fibrin formation in the patient’s body so that D-dimer levels will increase according to the severity of COVID-19 disease. In addition, comorbid illnesses that COVID-19 patients have can also increase D-dimer levels. D-dimer levels may increase due to other illnesses suffered by COVID-19 patients\(^3\). D-dimer is a risk factor for the severity of COVID-19\(^9\).

We search several studies to determine the combination of biomarkers to predict the severe COVID-19. The NLR has high sensitivity as a marker of severe COVID-19\(^{16}\). High levels of NLR and CRP have a high hazard ratio to the severity of COVID-19\(^6\). The combination of 6 variables (serum amyloid A, interleukin-6, lactate dehydrogenase, neutrophil-to-lymphocyte ratio, D-dimer, cardiac troponin, renal biomarkers, lymphocytes, and platelet count as a marker of COVID-19 severity\(^{17}\). Ponti et al also suggested that elevations of the biomarkers NLR, CRP, erythrocyte sedimentation rate (ESR), PCT, interleukin (IL)-6, D-dimer, troponin, creatine kinase (CK), and aspartate aminotransferase (AST) were associated with the severity of COVID-19\(^{18}\). Further research is needed on the sensitivity and specificity of this scoring using several samples adjusted for diagnostic tests.

**Conclusion**

High NLR ratio, D-dimer levels, and high CRP levels are risk factors for severe COVID-19. Meanwhile, high levels of procalcitonin are not a risk factor for the severe COVID-19. The combination of CRP, NLR, and D-Dimer as risk factors for the severe COVID-19.

**Ethical Approval:** We have conducted an ethical approval base on the Declaration of Helsinki with the registration of research at the Health Research Ethics Committee in Sanglah General Hospital, Denpasar, Indonesia.

**Funding:** None.

**Conflict of Interest:** The authors declare that they have no conflict of interest.

**References**


Correlation of Monocyte Lymphocyte ratio and Interferon gamma Interleukin 4 Ratio on Sputum Positivity in Patients with Pulmonary Tuberculosis


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Abstract

Objective: The study aimed to analyze the correlation between monocyte lymphocyte ratio (MLR) and interferon-gamma interleukin-4 ratio (IFN-γ/IL-4) on sputum positivity of acid-fast bacilli (AFB).

Method: The design of this study used a case-control design which was carried out in the period January – June 2020. Case defined as bacteriologically confirmed tuberculosis, while control defined as clinically confirmed tuberculosis. The technique for collecting participants was consecutive sampling. This study analyzed the MLR, IFN-γ/IL-4 ratio, and tuberculosis status.

Result: The average age of the participants is 45.74 ± 16.54 years with a median value of 46.50 (20 – 77) years. A total of 54.5% of the study subjects had a MLR value of 0.64 and 45.5% of the study subjects had an IFN-γ/IL-4 ratio value of 31.2. Only the association between the MLR value group showed significance on the results of AFB sputum examination with \( p \)-value = 0.046

Conclusion: the association of MLR on sputum positivity of AFB was significant, while no significant between IFN-γ/IL-4 and sputum positivity of AFB.

Keywords: monocytes lymphocytes ratio, IFN-γ/Interleukin-4 ratio, acid-fast bacilli, tuberculosis lung

Introduction

Tuberculosis (TB) is currently a public health problem in the world, even though efforts to control the strategy of directly observed treatment short-course (DOTS) have been implemented in many countries since 1995. Based on data from the Global Tuberculosis Report from the World Health Organization (WHO) in 2015, there were 9.6 million people with TB worldwide. This disease caused about 1.3 million deaths and was the 9th leading cause of death over the last five years in 2012–2016\(^{(1)}\).

Indonesia is one of the five countries that account for the largest incidence of TB. Indonesia ranks 2\(^{nd}\) in the world for the largest number of TB incidence cases after India\(^{(1,2)}\). According to WHO data, a major problem hampering control efforts and driving the TB epidemic is the large reservoir of undiagnosed smear negative pulmonary TB disease which comprise ~30 to 50% of the total TB burden. Every year, one in three

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Mail: ayajsp@gmail.com
people who fall ill with TB are left undiagnosed or not registered by health systems mainly in TB high burden countries(3). The existence of a non-sputum biomarker as an indicator for starting therapy and evaluating the success of therapy can facilitate treatment success and be able to develop more effective treatment strategies(4).

In patients with pulmonary TB, lymphocytes play an important role in providing an immune system response that will fight against MTB that enters the body. In a previous study, it was stated that TB patients with low lymphocytes had a higher recurrence rate (15.6%) and more severe clinical manifestations such as respiratory failure in 34.3% of patients. A decrease in the number of lymphocytes or lymphopenia can result in the development of bacteria that increases sharply because the body’s ability to fight infection is disrupted. An increase in the number of bacteria can cause permanent damage to the lungs which can be accompanied by more serious complications, including pleural effusion or pneumothorax(5).

The balance of cytokine activity between Th1 and Th2 cells in the adaptive immune system has an important role in protection against MTB infection. Decreased response of TB patients to the anti-tuberculosis drug (ATD) as evidenced by low sputum conversion (86.4% of the sample) in samples with low levels of Th1 cytokines (IFN-γ) and high Th2 cytokines (IL-4)(6). Increased activation and production of Th2 cell cytokines accompanied by decreased Th1 cell activation are associated with the development of infection and progression of TB(7). IFN-γ is the main cytokine in natural immunity secreted by Th1 cells, which plays a role in the formation of granulomas and the elimination of MTB bacteria through the activation of macrophages towards the M1 phenotype. While IL-4 is the principal cytokines produced by Th2 cells that act as an anti-inflammatory and contribute to the survival of MTB bacteria in dealing with the immune system(8).

As an important element of immunity against TB, the levels of monocytes, lymphocytes, and IFN-γ and IL-4 cytokines in peripheral blood indicate the level of immunity to infection by MTB. A peripheral blood examination is a routine examination in clinical practice, but the monocyte lymphocyte ratio (MLR) and the IFN-γ/IL-4 ratio as a simple biomarker are rarely used in clinical practice(9).

The association between MLR values and the risk of infection by MTB was first reported in 1920 by Florence Sabin, et al. They get MLR values on peripheral blood tests reflecting the extent of extension and progression of TB. In another study, it was reported that an increase in the MLR value was associated with the risk of TB in adults, children, and postpartum women with HIV infection. While the decrease in the ratio of IFN-γ/IL-4 is said to be related to the incidence of more severe lung infections such as milier TB and necrosis of lung tissue. In mice given MTB infection, increased IL-4 values were correlated with peribronchial and lung interstitial necrosis(10). In this study, we wanted to analyze the MLR and IFN-γ/IL-4 ratio on blood examination to sputum positivity of pulmonary TB patients as markers of diagnosis of active TB infection.

**Method**

The participants in this study were TB patients undergoing treatment at the hospital. Participant’s inclusion criteria included patients diagnosed with pulmonary TB, aged >18 years, bacteriologically and clinically confirmed pulmonary TB patients. Participants’ exclusion criteria included pulmonary TB patients who had received ATD and pulmonary TB patients with comorbid malignancies, heart disease, SLE, sarcoidosis, RA, asthma, liver fibrosis, and Alzheimer’s. Written informed consent was obtained from all participants.
The design of this study used a case-control design which was carried out in the period January – June 2020. The number of participants in this study was 66 participants (case group = 33 participants and control group = 33 participants) of which case was a bacteriologically confirmed TB patient and control was a clinically confirmed TB patient. The participant collection technique used consecutive sampling. This study analyzed the MLR, IFN-γ/IL-4 ratio, and tuberculosis status.

MLR is the absolute number of monocytes compared to the absolute number of lymphocytes, the data obtained from the results of routine complete blood tests when diagnosed with pulmonary TB. The MLR value is categorized into 2, namely high and low based on the median value after the normality test on the data distribution is carried out. The IFN-γ/IL-4 ratio is a comparison of the value of the proinflammatory cytokine IFN-γ to the anti-inflammatory cytokine IL-4. The data was obtained from the results of blood serum examination when initially diagnosed with pulmonary TB, examined using the enzyme-linked immunosorbent assay (ELISA) method. The IFN-γ/IL-4 ratio is categorized into 2, namely high and low based on the results of the normality test of the measurement results.

Active TB was pulmonary TB with clinical symptoms, radiological features, and microbiological evidence (rapid test molecular/AFB sputum) show signs of active TB. Clinical symptoms of active TB are typical symptoms of TB infection, namely coughing up phlegm for 2 weeks or more, coughing up blood, fever or chills for more than 1 month, night sweats without physical activity. Radiographic features of active TB are infiltrate, fibrosis, cavity, calcification, tuberculoma and pleural effusion. Bacteriologically confirmed TB was determined by sputum examination using Xpert MTB/Rif Method, or AFB staining. Clinically confirmed TB is one who did not fulfil the criteria for bacteriological confirmation but had symptoms or sign suggestive TB and supported by typical radiographic features.

Descriptive statistical analysis used to describe the characteristics of the subjects based on the MLR ratio and the IFN-γ/IL-4 ratio. ROC curve analysis used to determine the intersection point of the MLR and the IFN-γ/IL-4 ratio. In addition, the AUC (area under the curve) value used to determine the sensitivity and specificity values of each marker. Bivariate analysis used to determine the association between increased MLR and decreased IFN-γ/IL-4 ratio with pulmonary TB sputum examination. The association between the two variables is significant if the p-value <0.05.

Result

Characteristic of Participant

The average age of the participants was 45.74 ± 16.54 years with a median value of 46.50 (20 – 77) years. The participant was dominated by the male gender (69.7%). A total of 22.7% of the study subjects had a positive HIV status and 50% of the study subjects had a positive AFB sputum examination result (the same proportion as a negative AFB sputum examination result). Details of participant characteristics in this study can be seen in table 1.

The median value of absolute monocyte levels was 0.59x10^9/L, the median value of absolute lymphocyte levels was 1.04x10^9/L, the median value of the MLR was 0.56, the median value of IFN-γ levels was 2.63 pg/mL, the median value of IL-4 levels was 0.09 pg/mL, and the median value of the IFN-γ/IL-4 ratio was 30.43 (table 2).

Association between MLR and IFN-γ/IL-4 Ratio on AFB Sputum Examination

Our study found that monocyte levels, interferon-γ levels, MLR values, and IFN-γ/IL-4 ratios were higher in the group with positive smear sputum examination,
while IL-4 levels were slightly higher in the group with the results of the sputum smear examination were negative. Absolute lymphocyte levels between the two groups did not differ much. However, all the associations of inflammatory markers in this study were not significantly associated with AFB sputum results (Table 2).

**Receiver Operating Characteristics Analysis for Determination of Area Under Curve, Cut off Point, and Sensitivity and Specificity of MLR and IFN-γ/IL-4 Ratio**

The researchers then performed a Receiver Operating Characteristics (ROC) analysis was performed on various markers of inflammation on the results of AFB sputum examination in TB patients expressed in AUC values. The monocyte level has an AUC of 0.583, the absolute lymphocyte level has an AUC value of 0.488, the IFN-γ level has an AUC value of 0.546, the IL-4 level has an AUC value of 0.468, the MLR has an AUC value of 0.577, and the IFN-γ/IL-4 ratio has an AUC value of 0.543. The interpretation of the AUC values of various inflammatory markers on the results of AFB sputum shows a weak level of accuracy.

In this study, the cut-off point of the ratio of monocytes and lymphocytes was 0.64 with a sensitivity level of 54.5% and a specificity level of 69.7%. Meanwhile, the cut-off point for the IFN-γ/IL-4 ratio is 31.2 with a sensitivity level of 54.5% and a specificity level of 57.6%. In this study, the highest sensitivity value was in absolute monocyte levels and the highest specificity value was in the MLR. The intersection points of the ratios of inflammatory markers were then used to form a bivariate analysis of the two groups (Figure 1).

**Bivariate Analysis of MLR and IFN-γ/IL-4 Ratio based on ROC/AUC Cut-off Point with AFB Sputum Examination**

We then divided the MLR and IFN-γ/IL-4 ratio using the intersection point of the ROC/AUC curve analysis into 2 groups. A total of 54.5% of the study subjects had a MLR value of 0.64 and 45.5% of the study subjects had an IFN-γ/IL-4 ratio value of 31.2. Only the association between the MLR value group showed significant results on the results of the AFB sputum examination with p-value = 0.046 (Table 3).

---

*Figure 1. ROC (Receiver Operating Characteristics) analysis between cytokines inflammation on sputum positivity of AFB examination*
### Table 1. Characteristics of participants

<table>
<thead>
<tr>
<th>Variables</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
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<tr>
<td>Male</td>
<td>46 (69.7)</td>
</tr>
<tr>
<td>Female</td>
<td>20 (30.3)</td>
</tr>
<tr>
<td><strong>HIV</strong></td>
<td></td>
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<tr>
<td>Positive</td>
<td>15 (22.7)</td>
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<tr>
<td>Negative</td>
<td>51 (77.3)</td>
</tr>
<tr>
<td><strong>Acid-Fast Bacilli</strong></td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>33 (50.0)</td>
</tr>
<tr>
<td>Negative</td>
<td>33 (50.0)</td>
</tr>
<tr>
<td><strong>X-ray</strong></td>
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</tr>
<tr>
<td>Infiltrate</td>
<td>6 (9.1)</td>
</tr>
<tr>
<td>Fibrosis</td>
<td>1 (1.5)</td>
</tr>
<tr>
<td>Fibroinfiltrate</td>
<td>14 (21.2)</td>
</tr>
<tr>
<td>Cavity</td>
<td>11 (16.7)</td>
</tr>
<tr>
<td>Consolidation</td>
<td>29 (43.9)</td>
</tr>
<tr>
<td>Cavity and fibroinfiltrate</td>
<td>2 (3.0)</td>
</tr>
<tr>
<td>Cavity and consolidation</td>
<td>1 (1.5)</td>
</tr>
<tr>
<td>Normal</td>
<td>2 (3.0)</td>
</tr>
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</table>

### Table 2. Correlation between MLR and IFN-γ/IL-4 ratio on sputum positivity of AFB

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean ± SD</th>
<th>Median (Min-Max)</th>
<th>Sputum AFB</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Monocyte</td>
<td>0.78 ± 0.97</td>
<td>0.59 (-0.03 – 7.90)</td>
<td>0.65 (0.03 – 1.76)</td>
<td>0.58 (0.05 – 7.90)</td>
</tr>
<tr>
<td>Lymphocyte</td>
<td>1.51 ± 3.16</td>
<td>1.04 (-0.49 – 25.86)</td>
<td>1.04 (0.49 – 25.86)</td>
<td>1.04 (0.35 – 5.61)</td>
</tr>
<tr>
<td>MLR</td>
<td>0.67 ± 0.66</td>
<td>0.56 (-1.60 – 2.86)</td>
<td>0.69 (-1.02 – 2.86)</td>
<td>0.53 (-1.60 – 1.45)</td>
</tr>
<tr>
<td>IFN-γ</td>
<td>6.32 ± 7.97</td>
<td>2.63 (0.15 – 35.71)</td>
<td>3.47 (0.15 – 32.89)</td>
<td>2.48 (0.15 – 35.71)</td>
</tr>
<tr>
<td>IL-4</td>
<td>0.14 ± 0.35</td>
<td>0.09 (0.03 – 2.89)</td>
<td>0.09 (0.03 – 2.89)</td>
<td>0.10 (0.04 – 0.23)</td>
</tr>
<tr>
<td>IFN-γ/IL-4</td>
<td>70.97 ± 100.01</td>
<td>30.43 (0.79 – 518.61)</td>
<td>28.6 (0.79 – 519.40)</td>
<td>28.6 (1.33 – 446.40)</td>
</tr>
</tbody>
</table>
Table 3. correlation between MLR and IFN-γ/IL-4 ratio on sputum AFB based on categorization

<table>
<thead>
<tr>
<th>Variable</th>
<th>Sputum AFB</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MLR</td>
<td>≥0.64</td>
<td>18 (54.5)</td>
<td>10 (30.3)</td>
<td>0.046*</td>
</tr>
<tr>
<td></td>
<td>&lt;0.64</td>
<td>15 (45.5)</td>
<td>23 (69.7)</td>
<td></td>
</tr>
<tr>
<td>IFN-γ/IL-4</td>
<td>≤31.2</td>
<td>15 (45.5)</td>
<td>19 (57.6)</td>
<td>0.325</td>
</tr>
<tr>
<td></td>
<td>&gt;31.2</td>
<td>18 (54.5)</td>
<td>14 (42.4)</td>
<td></td>
</tr>
</tbody>
</table>

Note: AFB = acid-fast bacilli; *significant < 0.05.

Discussion

In this study we found that MLR was associated with AFB sputum examination. Monocytes are an essential component of the innate immune system that plays a role in connecting with the adaptive immune system. The MLR in peripheral circulation shows the capacity of an individual to carry out an effective immune response so that it is correlated with the growth inhibition of *Mycobacterium sp* in vitro. Monocytes that will turn into macrophages at the site of infection after 24-28 hours are markers of chronic inflammation. Inflammatory stimuli and increased numbers of chemoattractant molecules lead to an increase in the number of monocytes in the peripheral circulation (monocytosis) and at the site of infection, especially in the specialized form of alveolar macrophages in TB infection. Monocytes are the site of MTB proliferation, on the other hand, lymphocytes are components that provide resistance (clearance) so that their number decreases in the peripheral circulation (resistance index). This is supported by previous studies which found lymphopenia (22.1%), neutrophilia (14.2%), monocytosis (23.5%), increased MLR, and increased neutrophil/lymphocyte ratio in TB patients.

Increase MLR value in active TB are associated with MTB infection that interferes with a subset of hematopoietic stem cells or directly infects bone marrow mesenchymal stem cells. Infection of MTB attacks the myeloid and lymphoid pathways to varying degrees, causing variations in MLR. The MLR value has quantitative variations with different phases of treatment, so it is used to evaluate treatment effectiveness.

The median value in the study of IFN-γ levels was 2.63 pg/mL, the median value of IL-4 levels was 0.09 pg/mL, and the median value of the IFN-γ/IL-4 ratio was 30.43. In a previous study, the mean IFN-γ/IL-4 ratio was 9.3 ± 4.6 pg/mL in patients newly diagnosed with pulmonary TB, and higher in the latent TB population 9.8 ± 3.8 pg/mL, and the healthy population was 10.2 ± 3.4 pg/mL. The normal value of IFN-γ is <2 pg/mL, so this study shows an increase in this marker but not as high as other previous studies. Another study by Hussain in Pakistan showed a higher mean increase in IFN-γ levels up to 48.69 ± 28.78 pg/mL in the case group.
and 12.99 ± 5.7 pg/mL in the control group with a significant difference between the two. In addition, there is a negative correlation between interferon-gamma levels and the duration of ATD\(^{(15)}\).

Cells that play a role in cell-mediated immunity are lymphocytes, especially T helper (Th) lymphocytes which are divided into Th1 (releasing the pro-inflammatory cytokine IFN-\(\gamma\)) and Th2 (secreting the anti-inflammatory cytokine IL-4). IL-4 plays a role in preventing macrophage activation induced by IFN-\(\gamma\) so that the effects of the two cytokines are opposite. The increase in IFN-\(\gamma\) levels but not significant is explained by the condition of newly diagnosed active pulmonary TB infection so that they have not received therapy or the therapy given has not reached 1 month. This condition indicates the patient’s immune response is good so that IFN-\(\gamma\) increases, but is not strong enough to fight the TB infection. IFN-\(\gamma\) levels generally will increase significantly after receiving ATD. Another influencing factor is the nutritional status of the patient (especially protein intake) which plays a role in the regeneration of damaged tissue. Good nutritional status can increase the clearance process of MTB which is characterized by an increase in cytokines IFN-\(\gamma\), TNF-\(\alpha\), and Inducible Nitric Oxide Synthase (iNOS). Another factor not assessed in this study was genetic polymorphism. A low IFN-\(\gamma\)/IL-4 ratio was also found in previous studies but did not provide a significant association as in this study. Elevated IL-4 is associated with latent TB infection, reactivation, extrapulmonary TB and more severe infection, therefore, further study should provide data on the patient’s clinical condition\(^{(16)}\).

**Conclusion**

The limit value of the MLR associated with smear-positive was 0.64. There is a significant association between the value of the MLR on the results of AFB sputum examination with a sensitivity of 54.5% and a specificity of 69.7%. There was no significant association between the value of the IFN-\(\gamma\)/IL-4 ratio on the results of the sputum smear examination.

**Ethical Approval:** We have conducted an ethical approval base on the Declaration of Helsinki with the registration of research at the Health Research Ethics Committee in Sanglah General Hospital, Denpasar, Indonesia.

**Funding:** None.

**Conflict of Interest:** The authors declare that they have no conflict of interest.

**References**


5. Prezzemolo T, Guggino G, La Manna MP, Di Liberto D, Dieli F, Caccamo N. Functional


Comparison of Nurses’ Image in Korean Online Newspaper Articles before and after COVID-19: A Text Mining Analysis

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Abstract

Background/Objectives: This study investigated nurse-related keywords which were presented together with nurse on phrase, clauses or sentence of documents or conversations in the Korea online newspaper articles.

Methods/Statistical analysis: Text mining, which is a common method of analysis for large datasets, was used to analyze the changes in nurses’ image before and after COVID-19. A total of the linking words with nurse were calculated by the number of presentation on online newspaper article in Naver before and after COVID-19. In order to identify the meaning of the words, clustering of the collected linking words by categories was analysed and the characteristics of each cluster were classified. Over 5,000 articles were identified as targets for a keyword analysis.

Findings: The most frequently presenting words were hospital, medical and patient. Before COVID-19, the words related to ‘workplace bullying’ were highly presented and after COVID-19, the words related to ‘care’ were highly presented.

Improvements/Applications: With analyzing the trends of changes and characteristics of words by COVID-19 and clusters, we attempted to investigate the image of nurse that the public think and feel about nurse.

Keywords: Nurse’ image; Online newspaper; COVID-19; Text mining analysis

Introduction

The World Health Organization (WHO) declared that COVID-19 entered the pandemic phase on March 11, 2020 [1]. As of May 24, 2020, there were 5,201,549 confirmed cases of COVID-19 and 337,405 deaths across the world [2], as well as 11,190 confirmed cases and 266 deaths in Korea, where the first confirmed case occurred on January 20, 2020 [3]. Since the beginning of this unprecedented public health emergency, nurses around the world have been on the frontlines [4], treating patients suffering from a highly contagious disease. A key aspect of being on the frontlines during this pandemic is the risk of contracting the virus. Accordingly, the media continues to highlight the role of nurses in responding to the pandemic, leading to an increase in public interest in both nursing and nurses[5].

Nursing is a patient-oriented, therapeutic interpersonal process, and the rapport between the nurse and patient is a key factor in its success.
Therefore, the image that a patient has of nurses is an essential factor in determining whether a therapeutic relationship with the patient will be effective. In addition, a positive public image of nurses is associated with increased self-evaluation, self-concept, professional intuition, and job performance and decreased turnover intention among nurses [6-8]. Therefore, the public’s image of nurses affects the quality of nursing, which in turn affects the quality of public health [9].

In today’s rapidly changing society, the public’s perception is greatly influenced by the media [10]. Therefore, the depiction of nurses in the media can have a considerable effect on the public’s attitudes and behaviors toward nurses [11]. Given the link between the public’s perception of nurses and the quality of public health, it is worthwhile to evaluate how nurses are portrayed in the media and how the portrayal is received by the public.

The MERS outbreak in Korea demonstrated the crucial role of the media in the public’s perception of nurses and nursing. In fact, COVID-19 is not the first time in recent history that Korean nurses have been on the frontlines of a public health crisis. In the MERS outbreak, Korean nurses worked day and night to protect the lives of the public despite considerable financial and non-monetary losses [12]. However, several aspects of the country’s response to MERS, including the information policy that prevented the public from obtaining accurate information through the media, the untimely response to MERS from the government, and the spreading of false information regarding the inadequate treatment of patients or neglected medical examinations, led to the perception that healthcare providers, including nurses, had become unreliable [12].

In the ever-changing situation created by COVID-19, no data have emerged to quantify the image of nurses or the public’s trust in nurses. News media is the most influential medium in forming public awareness of nurses [13]. Particularly in Korea, the internet and smartphones are integral to everyday life [14], and the public accesses news mostly via the internet [15]. Therefore, a textual analysis of online newspaper articles may provide valuable insights into the image of nurses, and is suitable for analyzing the medical service needs of consumers. Given that over four months have elapsed since Korea had its first confirmed case of COVID-19, there is also a sufficient amount of data from online news sources to evaluate the portrayal of nurses in the media.

There have been studies of nurses’ image in various media, including internet newspapers [16-17], hospital newspapers [18], and the internet and social media [19], but studies of nurses’ image in television [20-23] predominate. However, data analyzed in these studies predate COVID-19 and do not reflect the changes in the image of nurses since the beginning of the COVID-19 pandemic. A textual analysis of online news articles pre-and post-COVID-19 is expected to capture the breadth of images of nurses both within and outside of the nursing industry and provide a basis for a connection of relevant social issues or nursing policies. Therefore, this study aimed to help develop a strategy for the nursing community to deliver a desirable image of themselves and their profession by identifying the portrayals of nurses highlighted in the media.

**Method**

1. **Purpose of research**

Text mining, which is a common method of analysis for large datasets, was used to analyze the changes in nurses’ image before and after COVID-19. This study had two research goals. The first goal was to identify the associated words that appear in online news articles regarding nurses. The second goal was to analyze the nurse-related words to understand how
the image of nurses has changed after COVID-19.

2. Data collection

Data for this study were collected from Korean portal websites and social media. All phrases and sentences containing the word “nurse” were collected from the Naver news portal, which features articles from the largest share of news organizations in Korea, to extract words related to “nurse” [24].

Data were collected for two periods. First, data were collected from January 1, 2017 - December 11, 2019 for the analysis of nurses’ image before the occurrence of COVID-19. Second, data were collected from December 12, 2019 to May 10, 2020 for analysis of nurses’ image after the occurrence of COVID-19.

In the data collection phase, online news article data was collected from Naver using the Python algorithm for online data crawling. After collection, the data were stored in a form that could be analyzed.

3. Data analysis

In the next text mining stage, the data were preprocessed and analyzed using a range of analytic techniques commonly used in text mining. First, the data were preprocessed using a Python algorithm for natural language processing and morpheme analysis. The purpose of preprocessing the data was to analyze the grammar and structure of the text. Next, the textual data were converted into a term-document-matrix, a structured data type, and processed into a form suitable for analysis.

The extracted words from the processed data were then analyzed. Specifically, the words were classified by morphological analysis, frequency, and correlation analysis and visualization, and all related words appearing simultaneously with the word “nurse” were classified. Also, to examine the topics relevant to nurses discussed by the writers of the articles, the extracted words were clustered into categories of words with similar characteristics. The final nurse-related words (except for stop words) were arranged by three researchers to classify words with similar qualities. If there was a word corresponding to a higher-level concept among the classified related words or if there was a higher-level concept that could be used to refer collectively to a set of related words, the word was used as a characteristic of the corresponding related-word set group. Similar characteristics of the higher-level concepts were repeatedly identified to classify the characteristics of the related word set in a step-wise fashion. Through this process, the differences in nurses’ image in online newspaper articles before and after COVID-19 were statistically analyzed.

Result

1. Nurse-related news articles

There were 3,410 online news articles before COVID-19 and 1,626 articles after COVID-19 that contained keywords related to the word “nurse.” Before COVID-19, Yonhap News had the highest number of articles with 354 cases (10.4%), followed by Newsis with 348 cases (10.2%), News1 with 197 cases (5.8%), KBS with 161 cases (4.7%), Seoul Economic Daily (SED) with 141 cases (4.1%), and Kookmin Daily with 133 cases (3.9%). After COVID-19, Yonhap News had the highest number of articles with 167 cases (10.3%), followed by Newsis and News1 with 131 cases (8.1%) each, Joins.com with 73 cases (4.5%), and KBS and KookminDaily with 71 cases (4.3%) each (Table 1). In summary, over 5,000 articles were identified as targets for a keyword analysis.
Table 1. Number and percentage of nurse-related articles by online newspaper and type

<table>
<thead>
<tr>
<th>Number</th>
<th>Newspaper</th>
<th>Before COVID-19¹</th>
<th>After COVID-19²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
</tr>
<tr>
<td>1</td>
<td>354</td>
<td>10.4</td>
<td>167</td>
</tr>
<tr>
<td>2</td>
<td>348</td>
<td>10.2</td>
<td>131</td>
</tr>
<tr>
<td>3</td>
<td>197</td>
<td>5.8</td>
<td>131</td>
</tr>
<tr>
<td>4</td>
<td>161</td>
<td>4.7</td>
<td>73</td>
</tr>
<tr>
<td>5</td>
<td>141</td>
<td>4.1</td>
<td>71</td>
</tr>
<tr>
<td>6</td>
<td>133</td>
<td>3.9</td>
<td>71</td>
</tr>
<tr>
<td>-</td>
<td>2076</td>
<td>60.9</td>
<td>982</td>
</tr>
</tbody>
</table>

¹N = 3,410. ²N = 1,626.

2. Visualization of nurse-related keywords

A word cloud was used to visualize the highly relevant keywords from the main nurse-related keywords used in online newspapers before and after COVID-19 (Figure 1).
3. Analysis of nurse-related keywords

Among the nurse-related keywords identified in online newspaper articles before and after COVID-19, relevant keywords were derived and listed according to frequency (Table 2). Before COVID-19, the most frequently mentioned keywords were hospital (12,525 mentions), medical (5,953 mentions), patient (4,680 mentions), nursing (4,287 mentions), working (3,110 mentions), prohibit (2,737 mentions), workplace bullying (2,618 mentions), doctor (2,249 mentions), infant (2,075 mentions), and personnel (2,039 mentions). After COVID-19, the most frequently mentioned keyword were COVID-19 (7,278 mentions), hospital (5,955 mentions), medical (4,750 mentions), patient (3,930 mentions), infection (3,570 mentions), confirmed cases (2,698 mentions), diagnosis (2,517 mentions), isolation (2,292 mentions), care (2,039 mentions), and working (1,974 mentions).

Table 2. Results of nurse-related keywords by online news articles

<table>
<thead>
<tr>
<th>Rank</th>
<th>Keyword</th>
<th>n</th>
<th>%</th>
<th>Keyword</th>
<th>n</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hospital</td>
<td>12,525</td>
<td>17.6</td>
<td>COVID-19</td>
<td>7,278</td>
<td>12.4</td>
</tr>
<tr>
<td>2</td>
<td>Medical</td>
<td>5,953</td>
<td>8.3</td>
<td>Hospital</td>
<td>5,955</td>
<td>10.2</td>
</tr>
<tr>
<td>3</td>
<td>Patient</td>
<td>4,680</td>
<td>6.6</td>
<td>Medical</td>
<td>4,750</td>
<td>8.1</td>
</tr>
</tbody>
</table>
3. Analysis of nurse-related keywords

The nurse-related extraction results were classified into the five higher-order categories of place, character, specialty, relation, and work based on the characteristics of the keywords. Table 3 shows the frequencies by category and keyword before and after COVID-19.

This analysis reveals several keywords that began to appear only after COVID-19. For words related to place, “hospital” and “workplace” appeared most frequently before COVID-19. “Daegu,” which had not appeared before COVID-19, appeared after COVID-19. For words related to character, the most frequently appearing words before COVID-19 were “patient” and “doctor,” respectively. After COVID-19, they were “patient” and “personnel,” respectively. For words related to specialty, the most frequently appearing words before COVID-19 were “medical” and “nursing,” respectively. The word “COVID-19” emerged after the occurrence of COVID-19. For words related to relation, there was a significant difference between the most frequently appearing words before and after COVID-19. Before COVID-19, “workforce bullying” and “death” were the most frequently used words, and the words “care” and “support” emerged after COVID-19. For words related to work, the word “workload” appeared before COVID-19, and the word “physical contact” appeared after COVID-19.

<table>
<thead>
<tr>
<th></th>
<th>4</th>
<th>Nursing</th>
<th>6</th>
<th>Patient</th>
<th>3,930</th>
<th>6.7</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>Working</td>
<td>3,110</td>
<td>4.4</td>
<td>Infection</td>
<td>3,570</td>
<td>6.1</td>
</tr>
<tr>
<td>6</td>
<td>Prohibit</td>
<td>2,737</td>
<td>3.8</td>
<td>Confirmed cases</td>
<td>2,698</td>
<td>4.6</td>
</tr>
<tr>
<td>7</td>
<td>Workplace bullying</td>
<td>2,618</td>
<td>3.7</td>
<td>Diagnosis</td>
<td>2,517</td>
<td>4.3</td>
</tr>
<tr>
<td>8</td>
<td>Doctor</td>
<td>2,249</td>
<td>3.2</td>
<td>Isolation</td>
<td>2,292</td>
<td>3.9</td>
</tr>
<tr>
<td>9</td>
<td>Infant</td>
<td>2,075</td>
<td>2.9</td>
<td>Care</td>
<td>2,039</td>
<td>3.5</td>
</tr>
<tr>
<td>10</td>
<td>Personnel</td>
<td>2,039</td>
<td>2.9</td>
<td>Working</td>
<td>1,974</td>
<td>3.4</td>
</tr>
</tbody>
</table>
Table 3. Linking words by category

<table>
<thead>
<tr>
<th>Category</th>
<th>Rank</th>
<th>Linking word</th>
<th>Before COVID-19</th>
<th>n</th>
<th>Linking word</th>
<th>After COVID-19</th>
<th>n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Place</td>
<td>1</td>
<td>Hospital</td>
<td></td>
<td>12,525</td>
<td>Hospital</td>
<td></td>
<td>5,955</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Workplace</td>
<td></td>
<td>1,339</td>
<td>Deagu</td>
<td></td>
<td>1,630</td>
</tr>
<tr>
<td>Character</td>
<td>1</td>
<td>Patient</td>
<td></td>
<td>4,680</td>
<td>Patient</td>
<td></td>
<td>3,930</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Doctor</td>
<td></td>
<td>2,249</td>
<td>Personnel</td>
<td></td>
<td>1,360</td>
</tr>
<tr>
<td>Specialty</td>
<td>1</td>
<td>Medical</td>
<td></td>
<td>5,953</td>
<td>COVID-19</td>
<td></td>
<td>7,278</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Nursing</td>
<td></td>
<td>4,287</td>
<td>Medical</td>
<td></td>
<td>4,750</td>
</tr>
<tr>
<td>Relation</td>
<td>1</td>
<td>Workplace bullying</td>
<td></td>
<td>2,618</td>
<td>Care</td>
<td></td>
<td>2,039</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Death</td>
<td></td>
<td>1863</td>
<td>Support</td>
<td></td>
<td>655</td>
</tr>
<tr>
<td>Work</td>
<td>1</td>
<td>Working</td>
<td></td>
<td>3,110</td>
<td>Working</td>
<td></td>
<td>1,974</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Workload</td>
<td></td>
<td>1,840</td>
<td>Physical Contact</td>
<td></td>
<td>1,386</td>
</tr>
</tbody>
</table>

A word cloud was used to visualize the highly relevant keywords from the main nurse-related keywords used in online newspapers before COVID-19.

**Discussion**

In this study, the words simultaneously appearing with the word “nurse” were extracted from newspaper articles appearing on Naver, which is the most popular internet portal in Korea. The most frequent words related to place were “hospital,” “workplace,” and “Daegu.” The newly emerged keyword “Daegu” is the area where the first COVID-19 case was diagnosed in Korea and is significant as a place where many nurses from all over the country volunteer to work as medical personnel. Among the places most frequently associated with nurses, the keyword “hospital” was ranked in the top 1-2 words both before and after COVID-19 indicating that the word “nurse” is still associated with hospitals. In a study by Kim & Kim, direct contact with nurses was found to affect the image of nurses held by 46.1% of the sample, while mass media affected the image of nurses held by 16.3% of participants [25]. Fortunately, a previous study found that experience in hospitals affected the image of nurses held by the majority of people, and nurses were viewed highly favorably by the patients or caregivers whom they had cared for directly [23].

In the case of the most frequent words related to character, “patient” and “doctor” were ranked first and second, respectively, before COVID-19, and “patient” and “personnel” were ranked first and second, respectively, after COVID-19. Before COVID-19, “nurse” and “doctor” appeared with a high association on social networking websites such as Facebook and Twitter [19]. Conversely, after COVID-19, the words “patient” and “personnel” showed a high association with the word “nurse.” This finding appears to reflect the situation in Korea after mid-February when the lack of nursing personnel due to the spike in the number of patients with COVID-19 was revealed. Sufficient human resources are a significant component of an effective working environment [26]. Nevertheless, there has not been significant improvement in the level of staffing for nurses despite the nursing community’s insistence that adequate nursing personnel is crucial.
for patient outcomes [27-28]. The results of this study suggest the public may be beginning to show interest in the problem of the personnel shortage in nursing, which has so far only been noticed by the nursing industry, and this may be an ideal time to seek an increase in nursing personnel.

In the case of the most frequent words related to specialty, the word “COVID-19” emerged after COVID-19 in comparison to “medical” and “nursing” before COVID-19. This finding may reflect the current situation, in which nurses are actively serving as experts at the center of the COVID-19 response.

For the most frequent words related to place, character, and specialty, the image of nurses in internet newspaper articles before COVID-19 could be depicted as “with medical professionals, nursing patients in hospitals.” Conversely, the image of nurses in internet newspaper articles as “personnel nursing COVID-19 patients in local hospitals in Daegu” has emerged after COVID-19.

For the most frequent words related to relation, there is a clear difference in the words used before and after COVID-19. “Workplace bullying” and “death” were the most frequently used words before COVID-19, and words such as “care” and “support” emerged after COVID-19. After COVID-19, positive words were predominant, whereas before COVID-19, negative words were the most frequently used. This finding may be because after COVID-19, most news reports were about the actual work of nurses whereas before COVID-19, a great deal of public attention was paid to several provocative incidents involving nurses. For instance, the death of a nurse from burns and the sexual harassment of nurses in the workplace are among the several incidents that had drawn public attention to nurses [29]. News reports of these incidents were not intended to reflect the everyday reality of nurses and nursing work, but rather to select and interpret the reality from a particular perspective, which explains why “workplace bullying” and “death” were highlighted as words related to nurses. As a result of such news reports, public opinion in Korea supports resolving the problem of workplace bullying at the government level.

In countries such as Sweden, Britain, Japan, Canada, and France, workplace harassment laws have been enacted and enforced, which is considered an effective approach to the issue [30]. Thus, a revision to the Labor Standards Act, including a ban on workplace harassment, was implemented in Korea beginning on July 16, 2019 [31]. Although this law is not only for nurses, it is nevertheless a positive sign that a new law on workplace harassment has been introduced. However, to sustain the current positive image of nurses, the Korean nursing community needs to ensure that the recently implemented law results in specific policies that include site-oriented guidelines and standards.

In the case of the most frequent work-related words, the main finding was the appearance of the word “workload” before COVID-19 and the word “physical contact” after COVID-19. Keywords before COVID-19 were indicative of excessive nurse workload. According to the Health and Medical Workers’ Union survey [32] conducted in 2016, the average daily break and mealtime for nurses was 29.7 minutes, which was 22 minutes shorter than for other healthcare professions, and the average monthly number of meals nurses skipped was 5.9, which is about three times as many as that for other healthcare professionals. Nurses were also working 19.5 minutes more in overtime than other healthcare professionals. Poor working conditions and high work intensity are considered to be the leading causes of harassment in the workplace and nurse turnover [33-35]. In fact, the number of graduates of nursing schools in Korea is 97.3 per 100,000 people, the highest among the OECD countries, but the percentage of graduates who
are active nurses is 46%, which is only half of the OECD average\cite{36}. The government has tried to solve the shortage of nurses by increasing the number of nursing colleges to produce more nursing graduates\cite{37}. However, unless the poor working conditions for nurses are improved, it will not be possible to solve the shortage of personnel caused by high turnover.

After the COVID-19 outbreak, the frequency of the keywords “care,” “support,” and “physical contact” resulted in a positive image of nurses. This finding is consistent with the purpose of nursing, the study of caring, and a positive image of nurses. In Yom’s\cite{23} study, the caring images of nurses were the most prevalent, and subjects who had been cared for by nurses had formed a good image of nurses. Also, Kalisch\cite{38} reported that among the images of nurses on the internet, most were viewed as respectable, responsible, confident, and dedicated professionals.

The analysis of the most frequent words related to emotions and work showed that in general, the internet newspaper articles before COVID-19 gave an image of nurses as “receiving poor treatment for their work.” However, in internet newspaper articles after COVID-19, the image of nurses as “positive professionals caring for and supporting the patients by their side in the medical field” was highlighted.

After the COVID-19 outbreak, the image of nurses in the field showed their expertise and ability to care for patients with autonomy. Therefore, the public’s perception was likely more positive than the nurses themselves recognized, and their profession and expertise were acknowledged\cite{39}. This change in perception has been subtle, but it is believed that the images of nurses working in the field have begun to be transmitted through mass media. However, it requires considerable time and effort to change a fixed image, but the speed at which information is shared on the internet may accelerate the change\cite{40}. More importantly, it is necessary to examine the trends in nurse-related words in the future\cite{23} and focus on how they can be improved. The authors should discuss the results and how they can be interpreted from the perspective of previous studies and the working hypotheses. The findings and their implications should be discussed in the broadest context possible.

**Conclusion**

This study analyzed the image of nurses from nurse-related articles in Korean online newspapers. How the newspaper article interprets the role of nurses and delivers it to the public has a significant impact on the public’s image of nurses. Therefore, it is significant that the analysis used Korean online newspaper articles about nurses. In terms of nursing research, this study is meaningful because it provides insights into changes in public awareness of nurses before and after COVID-19. Furthermore, as a country that has been responding to COVID-19 for a longer period than many other countries, Korea will be able to provide a reference for the image reconsideration of nurses struggling around the world through this analysis.

However, this study has many limitations due to data bias and restrictions in analytic methods. First, there was a data imbalance in the period before and after the COVID-19 outbreak and between each newspaper. In order to overcome this limitation, it is suggested that in future research, data is analyzed by the form of media and source of data in order to fully comprehend its meaning. Second, the subjective judgment of the researchers was involved in eliminating meaningless words or stop words while extracting nurse-related words from the data. In this study, the rule that the consent of two or more researchers is required to remove a word was applied. Nevertheless, it is suggested that objective criteria are employed regarding the treatment of meaningless words or stop words in the analysis of the data to minimize the effect of subjectivity on the results.
Further research is also needed to determine how the content of online newspaper articles actually affects the images of nurses. For example, comments posted on the internet may indicate how much the general public trusts and accepts the content of an article. In addition, research on other forms of media, not only in newspapers, should be actively conducted. It is also necessary to constantly monitor nurses described in mass media such as newspapers and seek ways to encourage positive news reports in newspapers, so the public does not form a negative or inaccurate image of nurses. We look forward to continuing the study the image of nurses and to becoming nurses who can respond quickly to the changes.

**Ethical Clearance:** For ethical consideration of the study subjects, Nothing specific-No IRB needed.

**Source of Funding:** This research received no external funding

**Conflict of Interest:** The authors declare no conflict of interest.

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Erythema Multiforme after Pfizer- BioNTech COVID-19 Vaccination in Iraqi Patient

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Abstract

COVID-19 vaccine emerges as a revolutionary solution for the pandemic, but the rapid development of vaccines may misses non intentionally certain adverse events that may make a conflict on matter of safety of these vaccines.

Skin reaction may be one of the most noted short term side effects of the vaccines and erythema multiforme may be one of these presentations.

Key Words: COVID-19 ;COVID-19 Vaccine; Erythema multiforme

Introduction

The rapid development of vaccines against COVID-19 virus is one of the most important steps in the fight against the accelerated spread of this lethal viral illnessand the emergence of new strains that may be more fatal. No doubt the benefits and safety of most approved vaccines have been outweigh their possible risks and adverse effects as demonstrated in large clinical trials, recent harms have been reported, so the importance of post-marketing close follow up with large studies or observations is mandatory(1).

One of the most recently noted COVID-19 vaccines complications that had been reported include vesicular or maculo-papular skin rash, necrotic lesions, urticaria like reaction, chilblains-like lesions and drug induced eruptions(2).

Clinical trial results for BNT162b2 mRNA Covid-19 vaccine reported mild-to-moderate pain at the injection site within 7 days after administration, with severe pain in <1% of participants and redness or swelling in a lower percentage. Local reactions incidence did not increase after the second dose and were mostly mild-to-moderate and resolved within 1–2 days(3).

Case Report

Forty-nine years old lady presented with severe itching and skin rash on both hands with mild sore throat 1 day after receiving the first dose of Pfizer-BioNTech COVID-19 vaccine Batch no. fc 8289 from Alzahraa teaching hospital vaccination center in Alkout city, Iraq; the skin rash increase in severity 24 hour later, the patient gave no history of fever, dyspnea, cough or any gastrointestinal symptoms. The patient denies any history of drugs use apart from use paracetamol oral 2 week ago for headache, also has no history of febrile illness in the past few weeks and she has no history of chronic illnesses nor rheumatological diseases. On examination the patient was well, temperature 37.1°C, blood pressure 122/80 mmhg, pulse rate 90 per minute, respiratory rate 15 per minute and SaO2 98%.

Skin examination reveals multiple target lesions over the palmar aspect of both hands and distal forearm over both flexor aspect.(Figure1)
Figure (1): Skin rash

Oral examination discloses erythema and few small ulcers over buccal mucosa and palatal tonsils (Figure 2)

Systemic examination was negative.

The patient sent blood investigations, the following results:

- Hemoglobin 13.3 gm/dl
- Platelet count 212 x 10^9/L
- White blood cell 7.2/ccc, normal differential count
- ESR 22
- Herpes viruses serology negative
- Normal renal and liver function test

Normal urinalysis

The patient had been treated antihistamine and sent home with close follow up

Erythema multiforme (EM) is a rare self-limited skin disorder, that may recur, resulting from type IV hypersensitivity reaction to certain pathogens e.g., Mycoplasma, Human herpes viruses, drugs, and other various triggers (4)

Erythema multiforme minor represents a localized skin eruption with minimal or no mucosal involvement. The skin lesions evolve into pathognomonic target
lesions that appear within a 72-hour period and begin on hands and feet and may spread proximally.

Lesions may persist for at least 7 days and then begin to heal. An arcuate appearance may be present.

Erythema multiforme major is a more serious form of the disease, potentially life-threatening disorder in which there will be mucous membranes involvement and up to 10% of total body surface area (TBSA) may have epidermal detachment.

Steven-Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) is a widespread blistering mainly on the trunk and face, presenting with erythematous or pruritic macules and one or more mucous membrane erosions; epidermal detachment is less than 10% TBSA for Steven-Johnson syndrome / toxic epidermal necrolysis and 30% or more for toxic epidermal necrolysis.

Cell-mediated immun response may be responsible for the destruction of epithelial cells. The epidermis becomes infiltrated with CD8 T lymphocytes and macrophages, whereas the dermis displays CD4 lymphocytes infiltration.

There are some reported cases of EM/SJS/TEN following exposure to certain vaccine like Hepatitis B, DPAT and MMR.

Despite it may cause different degrees of adverse events but mortality still rare. (5)

The vaccination against COVID-19 process should be continue due to the great benefit of the vaccine on the way of fighting the epidemic and with careful interpretation and evaluation for the possible adverse event of each available vaccines

Ethical Clearance: Hospital and patient approvals were taken

Source of Funding: None

Conflict of Interest: None

References


Establishment of Identity and Suffocation Following Inhalation of Carbon Monoxide in a Series of Five Cases

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Abstract

A rapid and sudden death in a single incident like mass casualty poses challenge for health care facilities. Especially in such cases, identification of the deceased is the most important task for investigating police officers and doctors. The present study is a series of death of five young adult male workers, who died in a tragic fire which broke out in the confined space at under construction plant. All the bodies were rendered unidentifiable from facial recognition due to charring and blackening. The primary identification of the deceased was established based upon partially burnt clothes and personal belongings. The autopsy findings being superficial to deep burns, charring and blackening, soot particles in respiratory tract were similar in all the five victims. The blood preserved for estimation of carboxy-haemoglobin level showed positive results in all the five cases. Soot in trachea and increased carboxy-haemoglobin level in blood suggested that the persons were alive at the time of incident. In all the five cases, death was caused due to suffocation by inhalation of carbon monoxide gas associated with thermal injuries. Role of forensic experts is to help in the identification of victims and to determine manner and cause of death.

Key words: Carbon Monoxide Poisoning, Confined Space, Identification, Mass casualty, Suffocation.

Introduction

On earth, something is always burning, be it wild forest fires started by lightning or by people, controlled agricultural fires, or fossil fuels. When anything made up of carbon whether its vegetation, gasoline or coal burns completely, the only end products left are carbon dioxide and water vapour. But in most of the situations, burning remains incomplete like fires or burning fossil fuels, coal gas, wood stoves, fireplace, furnaces and generators and they produce a mixture of gases including carbon dioxide, carbon monoxide and methane. In Forensic point of view, relevant sources of exogenous carbon monoxide include inferior or faulty heating devices, gas powered engines, motor vehicle exhaust fumes, fire related inhaled smoke and burning charcoal. The incidences of fire related mass casualty in a confined space pose a challenging task for the forensic investigators as well as for the police investigators in terms of establishment of identity of the deceased victims as well as their cause of death.

The confined space is a space in which because of its construction, location or contents, the accommodation of a hazardous gas, vapour, dust or fume or the creation of an oxygen deficient atmosphere may occur.
The present study is a series of death of five young adult male workers who died in a massive fire which broke out in a confined space at an under construction industrial plant and its medico legal significance in terms of identification of victims, cause and manner of death of deceased.

Observations

A massive fire broke out in a confined space of an under construction industrial plant. After extinguishing the fire, the recovered bodies of five adult male workers were brought by the police personnel for autopsy. Complete charring and blackening had left all the five bodies unidentifiable by their facial recognition. The primary identification of deceased was established by personal belongings which was observed on individual deceased as partially burnt clothing, wallet, mobile phones, wrist watch, metallic bangle and backpacks. In the presence of deceased’s relatives, the list consisting of names of all the workers who were present in that plant at the time of the incident with their personal effects, cross verification was carried out, thus establishing the identities of all the victims. In each case, samples in form of tooth and piece of sternum bone were preserved for DNA Analysis to confirm the identity.

The external examination of all the five deceased comprised of 100 percent superficial to deep burns with blackening, charring and heat ruptures at places. On internal examination, the lungs were congested and grossly edematous having cherry red discoloration with multiple pin head sized petechial hemorrhages on the inter-lobar surface. Black colored soot particles were seen embedded in tracheal mucosa extending up to main bronchi. The autopsy findings were similar in all the five deceased. During autopsy, the blood sample of each deceased was preserved with a layer of liquid paraffin for detection of carbon monoxide gas, which was positive for carboxy-hemoglobin in all the victims. The lungs from each deceased were preserved in 10 % formalin for histopathological examination which showed congestion with diffuse pulmonary edema and intra alveolar hemorrhages.

The final cause of death for all the deceased was based upon both external and internal autopsy findings, Forensic Science Laboratory Reports, Histopathological Examination Report with circumstantial evidences and was concluded as shock due to burns with suffocation following inhalation of carbon monoxide.

Discussion

In many situations, it is extremely difficult to deal with mass casualty incidents especially related with fires. Intangible loss following death of heirlooms, loved ones to loss in industrial revenue are some of the imperceptible effects of fires which are incompensable. The major challenge faced by the forensic investigators is to establish the identity. The four legally admissible methodologies of identification are visual recognition, dental identification, finger print comparison and DNA typing. Ruwanpura R. et al had reported a case of Bus–Truck Collision with 19 severely burnt bodies and establishment of identities of all severely burnt bodies was done by their personal belongings, parts of clothing and dental characteristics. Similarly in the present case series, the identities of all the five completely charred and unidentifiable bodies were established by their personal belongings and were confirmed by DNA Analysis.

Suffocation is a type of asphyxia which results from deprivation of oxygen either because of lack of oxygen in the environment or inhalation of irrespirable gases or from obstruction of air passages at the level of mouth or nostrils. Carbon monoxide build up in toxic concentration in an inadequately ventilated space is potentially hazardous. It is a colourless, odourless, tasteless, non irritant and a chemical asphyxiant gas which is produced by
incomplete combustion of elements made of carbon. Its intoxication is the most common cause of death in combustion related inhalation injuries.\textsuperscript{9} Death in such cases usually follows anaemic anoxia due to the decreased oxygen concentration in tissues.\textsuperscript{10} Soot has a very heavy concentration of inorganic metals including lead, antimony and its presence along with elevated carbon monoxide saturation are suggestive of the victims being alive at the time of the incident.\textsuperscript{11} Zhu BL et al\textsuperscript{12} reported five fatalities due to carbon monoxide intoxication accompanied by respiratory distress secondary to inhalation of incomplete combustion gases. Jongcherdchootrakul K et al\textsuperscript{13} reported 67 deaths due to suffocation at a pub fire in Bangkok. Similarly in the present case series all the five deceased died due to suffocation following inhalation of carbon monoxide gas which was confirmed by presence of carboxyhaemoglobin in blood.

Thus, it is of utmost importance to determine the role of each and every article present at an industrial plant and what role they could play in contributing to inflammability or combustible by products of noxious nature in a fire scene.

\textbf{Conclusions}

Carbon monoxide poisoning has been accepted as one of the leading significant cause of fatalities. To prevent such tragic incidents in future, one must determine the effective fire control and escape plans at the potentially vulnerable industries and should bring about timely necessary changes. Effective fire control systems in form of practical and convenient fire escape plans - emergency exits, fire alarm systems and carbon monoxide detectors to be installed at such places. High rise buildings especially industrial plants to be constructed in a fire resistive and safety manner. Frequent and adequate training of the employees and workers in form of mock drills would prove helpful. Inflammable products to be banned at industrial sites and this could be enforced by regular timely frisking of the employees and workers.

\textbf{Ethical Clearance} – Not Applicable.

\textbf{Source of Funding} - Self

\textbf{Conflict of Interest} - Nil

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Barriers to Antenatal Care Use among Pregnant Women

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Abstract

Background: Antenatal care is the routine health program of pregnant women to reduce the risk of stillbirths and pregnancy complications and give women a positive pregnancy experience.

Objectives: This study aims to assess the utilization ratio of antenatal care services and to identify current barriers to proper utilization of antenatal care services in Mosul city.

Subjects and Methods: A descriptive study was carried out during the period from 26 September, 2019 to 1st April 2020. The study has been conducted among three hospitals in Mosul city namely: Al- khansaa teaching hospital, Al- salam teaching hospital and Al-batool teaching hospital. The target population was pregnant women who attend maternity and child care unit. The study sample consists of 3000 pregnant women. Data collection tool was composed of (2) main parts. The first one was for socio demographic data about the pregnant woman. The second part was for gynecological, obstetric and antenatal care characteristics. It was constructed through use of (2) option- type (yes-no). Content validity was determined by presenting the items to a panel of scientific experts.

Results: Women with greater obstacles (mean=4.5) were found to be less likely than those with less barriers (N=60, mean=5.6) to receive prenatal care. There was a significant difference in prenatal care attendance between pregnant women who had no prior children (nulliparous) and pregnant women who had at least one prior child (multiparous) If t = 1.2, then the significance level is 0.05.

Recommendations: The study recommends establishing several antenatal care clinics in different areas of Mosul city to improve medical and nursing staff caring attitude in addition to increasing people’s awareness through health education about the importance of conducting antenatal care visits since the beginning of pregnancy.

Key words: Antenatal care, Obstacles, Utilization, Mosul

Introduction

Antenatal care is the routine medical and nursing care for pregnant women.(¹) It is a preventative treatment that allows physicians or midwives to address and prevent possible health issues during pregnancy.(², ³) Prenatal care is critical since 25% of maternal fatalities occur during pregnancy, with variations across nations due to unsafe abortion, violence, and illness. Pre-existing illnesses may worsen during pregnancy, according to studies. In a study of six West. A third of all pregnant women were sick throughout pregnancy, with 3% requiring hospitalization. Each woman’s health risks differ based on her pre-pregnancy medical status.(⁴, ⁵)

Method

Design and Sampling

This research is a survey research design. The
independent variables are: barriers to the use of antenatal care, which was categorized into more barriers and few barriers, child birth experience, categorized into no child birth experience and child birth experience, and level of education, categorized into primary, secondary and tertiary education while the dependent variable is actual attendance of antenatal care. Convenience sampling method was used, into the study.

**Participants and Setting**

A total of 300 participants were drawn from the population of pregnant women attending antenatal care at the PHCs. The demographic characteristics of the participants for this study are as follows: the participants’ ages ranged between 20 and 45 years, mean age ($\bar{x}$) = 29.8 years and standard deviation of (SD) = 5.9. On marital status, (93.9%) of the participants were married, while (6.1%) were single. On the participants’ type of family, 96 (89.7%) were monogamous while (10.3%) were polygamous. Participants’ years of marriage for this study ranged from 1 year (6 months to 1yr) to 18 years, while the mean is $\bar{x}$ = 3.9 yrs. (SD= 5.0). Their educational status ranged from No school (0.87%), Primary school = 16 (14.0%), Secondary school (43.0%) to Tertiary school (42.1%).

**Measures**

This study utilized a structured questionnaire to gather data. An ethnic group, age, location, educational qualification and marital status are all included in the demographic section. Oyinlola and Sunmola created a new Barriers to Antenatal Care Use Scale (2013) (6). The scale was created and standardized for the research to assess potential obstacles to prenatal care. It has 31 items with Yes/No responses. These obstacles fall into three categories: choice to seek treatment, access to care, and appropriate care. Pregnancy is a private issue and I don’t want to speak about it with anybody other than my family members. All things are negative. The scale is assessed by adding up the answers and dividing by 31, with higher scores indicating more obstacles and lower scores indicating less. Alignment is 0.63. Actual Attendance of Antenatal Care Scale established by Oyinlola and Sunmola (2013)(6). The scale asks three questions: did you keep your previous appointment? Did you keep your last two prenatal appointments? Did you keep all three of your last appointments? The participant’s answers were verified by looking up their prenatal appointment cards in the clinic’s records. If a pregnant woman misses one prenatal visit in the past three, she is not regularly attending antenatal care appointments. The scale’s internal consistency was 0.81.

**Procedure**

From the start, all respondents were fully informed of the study’s academic character. Before giving permission, they were assured of their answers’ privacy and secrecy. The questionnaire was given in Arabic and all participants completed it independently. Two research assistants helped distribute the surveys. The research utilized a total of 118 questionnaires, of which 118 were well-completed. The finished copies were graded and analyzed using Stata 17.0. The research received ethical clearance from the Mosul Ministry of Health and informed permission from the pregnant women. The data was analyzed using descriptive statistics, t-tests, and one-way ANOVA.

**Results**

When pregnant women encounter more obstacles, their attendance at prenatal care decreases ($p \ 0.05$) compared to pregnant women who don’t face as many. Thus, women with fewer obstacles (mean = 5.6) were more likely to attend prenatal care than those with higher barriers (mean = 4.5), according to the study. Compared to women with secondary and tertiary
degrees, women with just a primary education were less likely to seek prenatal care, \( P > 0.05 \), as shown in Table 2. This shows that the degree of education of the participants had no effect on their actual attendance at prenatal care. Compared to women who have had at least one child, pregnant women with no children are more likely to go to prenatal care, as seen in Table 3 \( p > 0.05 \). Compared to women who had at least one child, pregnant women who had no children mean = 5.2) were more likely to receive prenatal care.

### Table 1. “Independent t-test comparing pregnant women on levels of barriers and actual attendance”.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Barriers</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Attendance</td>
<td>Fewer</td>
<td>120</td>
<td>5.2</td>
<td>0.9</td>
<td>8.0</td>
<td>298</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>More</td>
<td>80</td>
<td>4.3</td>
<td>0.7</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 2. “Analyses of Variance (Anova) showing the influence of education on actual attendance of antenatal care”.

<table>
<thead>
<tr>
<th>Source of Variance</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean of Squares</th>
<th>F</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>5.4</td>
<td>3</td>
<td>1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Within Groups</td>
<td>197.5</td>
<td>295</td>
<td>0.7</td>
<td>2.6</td>
<td>0.82</td>
</tr>
<tr>
<td>Total</td>
<td>202.9</td>
<td>298</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Table 3. “Independent t-test, showing the influence of child birth experience by pregnant women on actual attendance”.

<table>
<thead>
<tr>
<th>Variable</th>
<th>No.ofchildren</th>
<th>N</th>
<th>MeanSD</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual Attendance</td>
<td>Nochild</td>
<td>166</td>
<td>4.6</td>
<td>1.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥1child</td>
<td>34</td>
<td>3.8</td>
<td>1.3</td>
<td>298</td>
<td>0.1</td>
</tr>
</tbody>
</table>

**Discussion**

The first hypothesis held. Contrary to popular belief, pregnant women who encounter greater obstacles are less likely to receive prenatal care. For example, Galmararian, Schwartz, Amacker and Powell (2007)(7) found links between low prenatal care initiation and low maternal satisfaction (Strickland and Strickland,1996)(8). Attendance at prenatal care was inconsistent among pregnant women who believed pregnancy is a personal matter that should be kept private. This was discovered to be a cultural problem throughout the study. An evil spirit is said to enter a pregnant woman’s womb if she announces her pregnancy. In addition to using herbs, 43.6 percent of pregnant women did not regularly visit prenatal care. According to the study, 25% of pregnant women who chose traditional delivery attendants did not visit prenatal care often enough. In the Akinyele local government general hospital,
pregnant women face significant obstacles that may prevent them from regularly attending antenatal care. They were clearly still devoted to their traditional pregnancy care. Financial and cultural obstacles to prenatal care availability and use have also been highlighted by Lincetto et al (2006)(9). While money is a problem for some pregnant women, 3.1 percent did not regularly attend prenatal care due to their belief that it was costly. Hypothesis two was ruled out. Contrast this with pregnant women with secondary or higher education who were more likely to receive prenatal care. Education did not affect pregnant women’s attendance at prenatal care. In the past, individuals may have gained knowledge and insight as a consequence of prior experiences.(10, 11) Prenatal care is an important part of a woman’s pregnancy and the benefits of attending it outweigh the risks. Preparation for delivery, health information, and support for pregnant women, their families, and communities. The lady and her family get relevant information, education, and guidance on diet, sleep, smoking cessation, avoiding alcohol and drugs, and parenting skills. It didn’t matter whether participants were literate or not since enough awareness had been established for the pregnant lady via all of this information and instruction. Pregnant women are very highly valued in Africa, particularly among the Yoruba people. Taking care of pregnancy is a social duty for elder women to younger women. This explains why a pregnant lady might seek assistance to deliver her kid even on the highway from a midwife. To conceal the pregnant lady during delivery, the ladies surrounding her remove their wraps. Hypothesis 3 was also confirmed. Less than half of women who have never given birth (nulliparous) will receive prenatal care (multiparous). Women with greater pregnancy experience (multiparous women) and women over 35 years old put less emphasis on prenatal care, according to a research by Regenstein et al. (2005)(12). People who have never given birth are likely to be curious and want to learn about caring for themselves and their unborn children. After achieving a need, people move on to the next level in Abram Maslow’s hierarchy of wants (Maslow 1943)(13). Women who have already given birth may not perceive the need to repeat the prenatal care procedure. For these pregnant women, family planning may be a motivation to either space their children or avoid having more.

Conclusion

Obstacles preventing pregnant women from getting prenatal care were shown to be important in this study. Less formal education did not influence antenatal care attendance among pregnant women who are well-informed about prenatal care. Also, younger women attended prenatal care more than older women who had at least one kid.

Recommendation

Even though it is the same woman bearing the baby, each pregnancy and birth is unique and should be handled as such. So that people they want to help or care for do not see them as evil, this research encourages health care professionals, especially doctors and nurses, to be patient with their patients. Emphasis should be placed on prenatal care and treating each pregnancy as a unique experience. The study’s findings lead to these recommendations. Barriers prevent achieving a goal. They want healthy kids with little or no issues. Achieving this goal is important to the community. WHO, UNICEF, and Save the Children are among those concerned about maternal and newborn health. While this study recognizes previous efforts to educate and inform pregnant women, the work should not stop there. Encourage pregnant women to seek prenatal care and to treat each pregnancy uniquely. Simply stated, people’s attitudes about health problems, perceived benefits, and barriers influence their adherence to healthy habits. Prenatal care benefits should be
regularly highlighted, while perceived barriers should be reduced. When pregnant women skip antenatal appointments, doctors and nurses should visit them at home. Vaccination programs for children, for example, need mobile health workers to go door to door. Similarly, pregnant women should be vaccinated and given the appropriate medications. It will also help erase negative views of doctors and nurses among pregnant women, since they will be leaving clinics to visit patients at home. Physicians and nurses may also call patients to remind them of appointments and check on their health. Doctors, nurses, and midwives should also be trained in prenatal care. Researchers found that pregnant women’s illness behavior differs. Women should avoid herbalists and traditional birth attendants who offer them possibly hazardous medications and combinations.

**Ethical Clearance**: The ethical approval was obtained for the Research Ethics Committee at Nineveh Health Directorate, Mosul Region, Iraq, before this study. The purpose was briefly explained to participants, and their consent was obtained. They were informed that they had the full right to withdraw at any time.

**Source of Funding**: Self

**Conflict of Interest**: Nil

**Bibliography**


The Relationship between Self-Efficacy for Exercise and Knee Pain among Older Adults with Knee Pain in Community-Dwelling of Bangkok Metropolis, Thailand

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Abstract

Objectives: Aimed to describe demographic characteristics, history of knee pain, history of exercise and assess the relationship between self-efficacy for exercise and knee pain among older adults with knee pain in community-dwelling of Bangkok, Thailand

Method: A cross-sectional study enrolled 220 participants with knee pain aged 50-65 years responded to a structured questionnaire, numeric pain rating scale (NPRS), and self-efficacy for exercise questionnaires (SEE). Descriptive statistics and Pearson’s correlation coefficient were used to analyze data.

Results: Knee pain was found in females more than males (64.1%, 35.9%). Participants had moderate pain with a low level of SEE and over 80% of them exercise less than 3 days per week include never exercise. A significant inverse relationship was found between SEE and NPRS.

Keywords: Knee pain, Self-efficacy for exercise, Older adults

Introduction

Knee pain is a common health problem among older adults and its leads to physical disability and restriction in activities of daily living (ADL). Prevalence of knee pain in older adults at age over 50 years ranges from 33% (as knee pain on most days for one month or longer) to 47% (as knee pain in or around the knee in the last year). The most common cause of knee pain related to aging also aged associated with a decline in physical functions, therefore leading to major musculoskeletal problems in the older adults. Exercise is one of the most effective non-pharmacological treatments to reduce knee pain because it safe and low-cost method for treating an older adult with knee pain that has been shown to relieve knee pain, improve the functional performance of the knee, delay further progression and prevent osteoarthritis in the future. The simple types of exercise for treating knee pain consist of knee range of motion exercise, aerobic exercise (such as cycling, jogging, and swimming), strengthen exercise (mainly to strengthen surrounding muscles from the knee joint). Despite previous studies has shown

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the benefits of enhanced exercise, many older adults remain physically inactive. From prior studies have found that only 41.4% of Thai older adults have been found to exercise. The Thai health policy recommendations that every Thai older adult should perform exercise 30 minutes a day, 3-5 days per week, and being physically active but 60-70% of Thai older adults did not meet the goal and older adults with knee pain have had restricted activity because of the pain then their activity levels could be much lower than among the general population. Therefore, it is important to understand the situation of knee pain in older adults and their exercise history that would facilitate an intervention program to encourage them to exercise which essential for those who live in suburban communities.

To date, most previous studies focus on the only group of older with knee osteoarthritis but there is no evidence concerning older adults in community-dwelling at ages starting from 50 years who had onset knee pain but not progression to knee osteoarthritis. Consequently, it is reasonable to concentrate on onset knee pain in this group and investigate their demographic characteristics and knee pain problems that would help to delay or prevention of knee pain progression among this group.

Self-efficacy plays an important role in health behavior, the concept of self-efficacy defined as perceived capability and confidence, specific to a particular domain of a person’s behavior, which it has been one of the most constantly described relates to exercise behavior. In older people, self-efficacy is a key factor of their beginning and maintenance to their goal-related exercise behaviors. There is currently limited understanding about self-efficacy among older adults who had onset knee pain, especially in Bangkok Thailand. This information could benefit for public health professionals to evaluate and develop an appropriate health interventions program to reduce knee pain, improve self-efficacy, and prevention of knee osteoarthritis for older adults in the future.

Objectives of the study: 1) To describe knee pain and their exercises and 2) to identify the relationship between self-efficacy for exercise and knee pain among older adults with knee pain in community-dwelling of Bangkok metropolis.

Materials and Method

An observational cross-sectional study was conducted in community-dwelling older adults who have had diagnosed knee pain by physicians at the selected public health center of Bangkok and participants had been recruited by using a convenient sampling method. The period of study started from August to September 2020. Total 220 participants were selected from inclusion criteria included: (1) both male and female gender (2) age 50-65 years (3) having knee pain either left, right or both knee during movement, knee pain at least on most days in a week or more within the past 12 months (4) able to understand Thai language (5) Willingness to participate in the study. Older adults presented with diagnosed osteoarthritis knee with radiologically confirmed or previous surgery any knee joint, visual and hearing impairment were excluded.

Measurement tool: This tool was developed by the researchers, based on reviewing related literature and experts’ opinions, written in Thai language. The tools were organized into 3 parts.

Part 1: Demographic characteristics. This part included gender, age, BMI, education, marital status, occupation, salary, medical history, knee pain, exercise.

Part 2: Numeric pain rating scale (NPRS) is a verbally-administered to measure knee pain in this study (scored from 0-10) with 0 = no pain
and 10 = the worst pain imaginable\(^{(15)}\). The values of NPRS cut-off points as scores \(\leq 3\) = mild pain, scores 4-6 = moderate pain, scores \(\geq 7\) = severe pain.\(^{(16)}\)

**Part 3:** Self-efficacy for exercise scale (SEE), the SEE measured perceived exercise capability of participants in many conditions for instance feeling bored, bad weather.\(^{(17)}\) The score range from 0-90, and a cut-off point is divided into 3 levels as following;\(^{(18)}\) low level = score 0-44.9, score 45.0-71.9 = moderate level and score 72.0-90.0 = high level respectively.

**Data collection procedures:** Participants completed a face-to-face interview. The data collection was done in 8 weeks at a selected community in Saimai district of Bangkok. All demographic data and structured questionnaires were collected by researchers.

**Data Analysis:** The data were analyzed by SPSS version 22, descriptive and correlational analyses (such as means, standard deviations, and Pearson’s correlation coefficient) were used to describe and determine the association between knee pain and self-efficacy for exercise, a P-value below 0.05 was considered statistically significant.

**Results**

Table 1: Demographic characteristics, history of knee pain, history of exercise, Self-efficacy for exercise (SEE), n=220

<table>
<thead>
<tr>
<th>Variable</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographic characteristics</strong></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>79 (35.9)</td>
</tr>
<tr>
<td>Female</td>
<td>141 (64.1)</td>
</tr>
<tr>
<td>Age (Years)</td>
<td></td>
</tr>
<tr>
<td>50-55</td>
<td>48 (21.8)</td>
</tr>
<tr>
<td>56-60</td>
<td>92 (41.8)</td>
</tr>
<tr>
<td>61-65</td>
<td>80 (36.4)</td>
</tr>
<tr>
<td>Age, mean (SD)</td>
<td>58.60 (3.46)</td>
</tr>
<tr>
<td><em>Body mass index (BMI), kg/m²</em></td>
<td></td>
</tr>
<tr>
<td>18.5-22.9 Normal</td>
<td>73 (33.2)</td>
</tr>
<tr>
<td>23 – 24.9 Overweight</td>
<td>84 (38.2)</td>
</tr>
<tr>
<td>(\geq 25) Obese</td>
<td>63 (28.6)</td>
</tr>
<tr>
<td>BMI mean (SD)</td>
<td>23.74 (1.76)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>Primary school</td>
<td>26 (11.8)</td>
</tr>
<tr>
<td>Secondary School</td>
<td>61 (27.7)</td>
</tr>
<tr>
<td>High School/Diploma degree</td>
<td>81 (36.8)</td>
</tr>
<tr>
<td>Bachelor degree</td>
<td>45 (20.5)</td>
</tr>
<tr>
<td>Master degree or higher</td>
<td>7 (3.2)</td>
</tr>
</tbody>
</table>
Cont... Table 1: Demographic characteristics, history of knee pain, history of exercise, Self-efficacy for exercise (SEE), n=220

<table>
<thead>
<tr>
<th>Marital Status</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Single</td>
<td>27(12.3)</td>
</tr>
<tr>
<td>Married</td>
<td>154(70.0)</td>
</tr>
<tr>
<td>Widowed</td>
<td>23(10.5)</td>
</tr>
<tr>
<td>Divorced/Separated</td>
<td>16(7.3)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Occupation</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Unemployed</td>
<td>11 (5.0)</td>
</tr>
<tr>
<td>Retired government officer</td>
<td>25 (11.4)</td>
</tr>
<tr>
<td>Government officer/ State enterprise employee</td>
<td>11 (5.0)</td>
</tr>
<tr>
<td>Company employee</td>
<td>27 (12.3)</td>
</tr>
<tr>
<td>Self-employed</td>
<td>35 (15.9)</td>
</tr>
<tr>
<td>Merchant</td>
<td>65 (29.5)</td>
</tr>
<tr>
<td>Employee</td>
<td>46 (20.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Income (THB per month)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;5,000 THB (&lt;155.6 USD)</td>
<td>19 (8.6)</td>
</tr>
<tr>
<td>5,001-10,000 THB (~155.7 - 311.2 USD)</td>
<td>65 (29.5)</td>
</tr>
<tr>
<td>10,001-15,000 THB (~311.3 - 466.9 USD)</td>
<td>88 (40.0)</td>
</tr>
<tr>
<td>15,001-20,000 THB (~467.0 -622.5 USD)</td>
<td>31 (14.1)</td>
</tr>
<tr>
<td>&gt;20,000 THB (&gt; 622.6 USD)</td>
<td>17 (7.7)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Have underlying disease</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>174 (79.1)</td>
</tr>
<tr>
<td>No</td>
<td>46 (20.9)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Knee pain</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Side of knee pain</td>
<td></td>
</tr>
<tr>
<td>Right knee</td>
<td>112 (50.9)</td>
</tr>
<tr>
<td>Left knee</td>
<td>85 (38.6)</td>
</tr>
<tr>
<td>Both knee</td>
<td>23 (10.5)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>The average duration of knee pain</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 7 Days</td>
<td>5 (2.3)</td>
</tr>
<tr>
<td>1-4 weeks</td>
<td>42 (19.1)</td>
</tr>
<tr>
<td>More than 1 month but less than 3 month</td>
<td>70 (31.8)</td>
</tr>
<tr>
<td>More than 3 months</td>
<td>103 (46.8)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Frequency of knee pain</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>All the time</td>
<td>39 (17.7)</td>
</tr>
<tr>
<td>Everyday</td>
<td>57 (25.9)</td>
</tr>
<tr>
<td>Every other day</td>
<td>104 (47.3)</td>
</tr>
<tr>
<td>Every week</td>
<td>16 (7.3)</td>
</tr>
<tr>
<td>Every month</td>
<td></td>
</tr>
</tbody>
</table>
Exercise
Frequency of usual exercise
Never
1 day per week
2 days per week
3 days per week or more
Duration of exercise per time (n = 192)
< 20 minutes
20-30 minutes
31-60 minutes
>60 minutes
28 (12.7)
107 (48.6)
61 (27.7)
24 (10.9)
92 (47.9)
59 (30.7)
31 (16.1)
10 (5.2)

Numeric pain rating scale (NPRS)
Mild pain
Moderate pain
Severe pain
NPRS mean (SD)
Self-efficacy for exercise (SEE)
Low(score 0-44.9)
Moderate (45.0-71.9)
High (72.0-90.0)
SEE mean (SD)
39 (17.7)
169 (76.8)
12 (5.5)
4.67 (1.15)
125 (56.8)
95 (43.2)
0 (0)
44.41 (5.13)

*WHO, BMI for Asian populations(19)

The characteristic of participants showed in Table 1. The majority of older adults with knee pain were female (64.1%). The mean age of participants was 58.6 years (SD = 3.46). Most of them were overweight (38.2%) as BMI range from 23 to 24.9 kg/m², were graduated high school or diploma degree (36.8%), and up to 70% were married. In regards to occupation and salary, 29.5% of participants were merchants with monthly income 10,001-15,000 THB (~311.3 – 466.9 USD) (40%). In addition, the majority (50.9%) reported knee pain at the right side with pain more than 3 months (46.8%) through every week (47.3%). Furthermore, they have shown that more than two-thirds (76.8%) had moderate pain levels with an average of NPRS 4.67 ±1.15.

Overall, they were less likely to exercise regularly, only 10.9% of participants met the criteria as Thai health policy recommendations(20), 48.6% were exercise only 1 day per week and 12.7% were inactive as reported never exercise. Moreover, it appears that people who exercise, they exercise less than 20 minutes per time up to 47.9%. Regarding SEE, the mean was 44.41 (SD= 5.13) and more than a half (56.8%) also reported having a low level of SEE.
Table 2: Correlation between Self-efficacy for exercise and Numeric pain rating scale

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation coefficient with NPRS</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-efficacy for exercise (SEE)</td>
<td>-0.1760</td>
<td>0.009**</td>
</tr>
</tbody>
</table>

**p< 0.01

The result of analysis in table 2 showed that there was statistically significant inverse relationship between self-efficacy for exercise and NPRS (r = -0.176, P < 0.01).

Discussion

The present study aimed to understand demographic characteristics, history of knee pain and exercise, and determine associations between self-efficacy for exercise and knee pain in Thai community-dwelling older adults with knee pain. As variations in the definition of knee pain, knee pain in the older adult group is common worldwide. The previous studies in China with knee pain older(21), the knee was usually reported as “site of pain complaints”, associated with many recent studies in European countries.(22, 23) Also consistent with previous literature(24), knee pain occurrence generally in community-dwelling older adults and this study revealed that knee pain in women(64.1%) had a higher percentage than in men (35.9%). Knee pain universally increases with age, about 25% of people at age more than 55 years reported knee pain in the past year.(23) Similar to our study, almost two-thirds of participants aged more than 55 years reported knee pain. Another factor observed in this study that influence knee pain was BMI. The mean BMI in this study was 23.74 (SD =1.76) and most of the participants were overweight (38.2%). This concurs with previous studies was found older who are overweight significantly more likely to have daily knee pain.(25) Although our findings illustrate that high BMI in an older adult with knee pain, indicating overweight as a possible cause of knee pain, the cross-sectional-study design of this study limits the ability to rule out other explanations. One such explanation might be a high BMI come after knee pain. That is, knee pain in older adults with normal weight may lead to a modern sedentary lifestyle behavior that contributes to weight gain. Moreover, the possible reason according to Thai culture, most of Thai people like to do floor activities such as kneeling on the floor or squatting and side knee bending through their daily works and activities.(26) These activities’ postures might accelerate the wear-and-tear on the knee joint and cause of knee pain.

We found that most of the participants in this study had a low level of self-efficacy for exercise is consistent with previous studies.(7, 27) Moreover, the low average score of self-efficacy for exercise indicates that older adults with knee pain will tend toward inactive and did less exercises as the consequence of worsening knee pain and disability. In addition, our results revealed that overall they had less exercise, this is in line with the study of Holden(28) which older adults with knee pain were not sufficiently active to achieve the benefits of exercise because of their problem with the knee joint and their health condition. Furthermore, our result showed that self-efficacy for exercise significant inverse relationship with knee pain. This finding correlates with previous studies that self-efficacy for exercise is important to understanding for those with knee pain, as older with high-level self-efficacy for exercise had a low level of knee pain and being active(29), it is indicating that both self-efficacy for exercise and knee pain among the older
adults group are key goals to explore that could be targeted to develop primary care interventions which appropriate for community-dwelling older adults.

**Limitations**

Our study is limited by a cross-sectional study with small sample size, the findings in this study will be difficult as our eligible study population was derived from Bangkok Thailand. Therefore, these results might not translate to older adults with knee pain in others countries. Although this, the study findings bling to light and could still be valuable in helping to design acceptable interventions for people with knee pain in primary health care across different countries.

**Conclusion**

Base on this research results, Thai older adults with knee pain had moderate pain with low self-efficacy for exercise and inactive. Moreover, self-efficacy for exercise of those people associated with knee pain. Older adults with knee pain may need further interventions to reinforce the importance of exercise, increase self-efficacy and reduce knee pain.

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**Conflict of Interest:** Non

**Ethical Clearance:** The study was approved by The Research Ethics Review Committee for Research Involving Human Research Participant, Health Science Group, Chulalongkorn University, Bangkok, Thailand (COA No.166/2020).

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The Importance of Histological Examination in Forensic Medical Practice

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Abstract

Background: Histopathological examination plays a significant role in the precise determination of the cause of death. Death scene investigation, full medical history of the patient, thoroughly performed macroscopic exploration of the body and its internal organs, supported by the results from a microscopic histological examination of the tissues, determine the forensic medical autopsy standards. These, as well as the skills and the experience of the forensic medical expert, guarantee an accurate forensic medical diagnosis for the medico-legal needs.

Methods: In order to sustain our preposition, we present a case from our practice. A man died during a hospital treatment for anemia and an autopsy, requested by the relatives, was performed. It was concluded that the cause of death was a hypostatic pneumonia. During the autopsy a histological material was taken but no examination was made. Months later, following a prosecutor’s order a histological examination was performed and evidence for a disseminated intravascular coagulation was found.

Conclusion: This is one of many cases in which there is a difference between the macroscopic and the histological diagnosis. Histopathological examination of the internal organs for the purpose of providing a medical cause of death is essential for the forensic practice and it should be undertaken whenever there is a doubt in the macroscopic diagnosis.

Key words: Histological examination, forensic histopathology, forensic medicine, forensic medical practice, autopsy, disseminated intravascular coagulation, pneumonia

Introduction

Nowadays, forensic medical practice differs in countries around the world. There are no uniform standards of professional forensic practice. Forensic histopathology is the application of histological techniques and evaluation to forensic pathology practice.¹ The histopathological examination of samplings of human tissue following medico-legal post-mortem autopsies is not mandatory and forensic experts only perform it under certain circumstances. Good medical practice is taking tissue samples in most cases for a future examination if ordered by the authorities. The value of routine post-mortem histological examinations raises questions in regard to forensic practice and its ability to provide the cause and manner of death. Most of the time the forensic medical expert determines the cause of death only by a macroscopic exploration of the corpse, especially in cases of severe traumatic lesions and after familiarizing himself with the death scene protocol and the medical history of the patient. In these cases, the histological examination could be useful only for the confirmation of the macroscopic findings and

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hence why it is seldom performed. Nevertheless, in cases of a sudden death or whenever there is uncertainty for the accurate forensic diagnosis, the histological examination should be undertaken for a precise determination of the cause. This would significantly reduce the possibility of forensic medical malpractice.

**Materials and Methods. Case Report**

A 54-year-old man was hospitalized for treatment of anemia. His medical history included an unspecified anemia, ulcerative colitis, esophageal candidiasis, hemorrhoids, hepatic steatosis, and chronic gastritis. During his hospital treatment, he attempted suicide by taking a large amount of a medication. After a psychiatric evaluation, it was concluded that the patient suffers from a psychoorganic syndrome. Following the suicide attempt, the patient could not be released from the hospital without an attendant, which he did not have at that time. After a month and a half stay in the hospital, he suddenly died. An autopsy, requested by the relatives, was performed 15 days after his death. The external examination determined an absence of rigor mortis. There were fixed purplish-red postmortem patches on the posterior uncompressed surfaces of the body. The skin was pale. No visible traumatic injuries were established. The upper and lower limbs were swollen. There were decubitus ulcers from prolonged pressure on the skin covering hips and tailbone. The internal examination revealed a severe bilateral confluent pneumonia with a bilateral pneumothorax and fibrinous pleuritis. A material for histological processing was collected but no examination was performed. It was concluded by the macroscopic findings that the cause of death was a hypostatic pneumonia resulting from a continuous horizontal position on the hospital bed. Two days before the patient’s death, a roentgenological examination was made with non-specific imaging data for a development of the pneumonic process. Months later, following a prosecutor’s order, a forensic medical expertise and a histological examination were requested.

**Results and Discussion**

The histopathological examination of samples from the internal organs revealed evidence for a disseminated intravascular coagulation in materials from brain, lungs, and myocardium. The histological examination of the lungs determined circulatory changes in the alveoli, interstitial and intraalveolar edema, ‘sludge’ phenomenon, atelectasis areas, aged focal inflammatory changes, compensatory emphysema, area of recent hemorrhagic infarction, and a disseminated intravascular coagulation. It was concluded by the histological findings that the cause of death was the disseminated intravascular coagulation and the hemorrhagic infarction of the lung, resulting in multiple organ failure. There was a difference between the macroscopic diagnosis and the microscopic one. The forensic medical expert did not examine the histological samples from the autopsy and incorrectly assumed the pneumonic changes were the cause of death. Not finding the hemorrhagic infarction of the lung was also an omission.
Figure 1. Disseminated intravascular coagulation in brain sample (a., b., c.)
Figure 2. Disseminated intravascular coagulation in myocardium sample (a., b.)
Figure 3. Disseminated intravascular coagulation in lung sample

Figure 4. Hemorrhagic infarction in lung sample
Figure 5. Aged focal inflammatory changes in lung samples incorrectly assumed as a present pneumonia (a., b.)
Medico-legal or forensic medical autopsies are performed at the behest and per the instructions of the legal authorities in cases of sudden, uncertain, suspicious, or criminal death. The primary goal usually is to determine the cause and manner of death. The forensic physician should be familiarized with the death scene protocol and supposed circumstances surrounding the death, and medical history of the patient. A post-mortem medical examination (autopsy) should be performed on the external and the internal part of the body. Blood and toxicology analysis should be done if necessary. The forensic autopsy differs in purpose and in procedure from the pathological or so-called hospital autopsy. The histological examination is more often performed in pathological autopsies rather than the medico-legal ones. Taking tissue samples for additional evaluation, their proper storage, preparation, and examination are a mandatory part of the forensic practice. This has been regulated in the ‘Harmonization of Medico-Legal Autopsy Rules’ protocol, adopted in 1999 by the Committee of Ministers of the member states of the European Union. It is required especially in cases of a sudden death, death occurred under unusual circumstances or death in a hospital setting.

Conclusion

Regularly, the histopathology is used to aid in the diagnosis and confirm or refute the macroscopic findings. There are differences in autopsy practice between each country so there is a variable rate of handling the histopathology in determining the cause of death. Taking samples and performing a routine microscopic examination more often should be considered in the forensic medical practice. Death scene investigation and properly performed autopsy carried out by an experienced forensic physician is not always sufficient to establish the cause of death. Furthermore, in some cases histopathological examination is an essential method to conclude an accurate forensic diagnosis. This ensures a good forensic medical practice for the medico-legal needs.

Acknowledgments: The authors are grateful to colleagues at Department of General and Clinical Pathology in Multifunctional Hospital for Active Treatment ‘Losenetz’ for their valuable help in the histopathological examination.

Conflict of Interest: The authors declare that they have no conflict of interest.

Funding: Self.

Ethical Clearance: Taken from the Ethical Committee of Multifunctional Hospital for Active Treatment ‘Losenetz’, Sofia, Bulgaria.

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Effects of Educational Interventions to Improve Safe Hazardous Drug Handling among Oncology Nurses: Systematic Review

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Abstract

Background: Oncology nurses are in the front line of handling Hazardous Drugs (HDs) in health care settings. It is crucial to minimize the cytotoxic effects of handling HDs among oncology nurses by following the safety standards practices, protocols, and guidelines. The purpose of this systematic review is to identify the effects of educational interventions to reduce exposure of hazardous drugs and chemicals among oncology nurses.

Methods: The review was performed following the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines. The search protocol was conducted using PubMed/MEDLINE, CINAHL, and Google Scholar, for studies published between the periods of 2013 to 2021. Nine articles were included in the systematic review.

Conclusion: Several interventions were identified including web-based online courses, educational modules, applied safety protocols, demonstration and re-demonstration, videos, PowerPoint presentations, seminars, and workshops. Following up nurses after applying different educational interventions showed enhanced adherence to safe handling of HDs. Applied educational interventions have been reported to improve self-efficacy, nursing performance, attitude, knowledge, and practice of cytotoxic drug handling. A better compliance was reported on nurses’ use of standard personal protective equipment, safety protocol during administration, handling of body fluids, and responding to spills of HDs.

Keywords: Hazardous drugs; Occupational health work; Oncology nurses; Safe handling

Introduction

Contamination of the work environment with Hazardous Drugs (HDs), increases the potential exposure of health care workers including nurses if they were not handled appropriately [¹]. Hazardous Drugs include chemicals used for cancer therapy that is known as a carcinogen, teratogen, and reproductive toxin. It also includes some antiviral drugs, hormonal agents, and other new drugs that mimic HDs in structure or the level of toxicity [²]. Work-related exposure to HDs has been associated with acute symptoms on different body systems including but not limited to hair loss, contact dermatitis, allergic reaction, abdominal cramps, eye injury, reproductive

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problems such as infertility, miscarriage, abortion, and fetal anomalies [3].

Exposure to HDs can occur during dispensing, compounding, and administering the drugs. Aerosols as well maybe spreading during HDs preparation and administration. [4][5]. Careful handling of such HDs is crucial to minimize the adverse events of exposure to toxic substances and reduce contamination in health care settings [1].

Compliance with the safety precautions including Personal Protective Equipment (PPE), training and education about the handling of HDs, using of engineering control to isolate the toxic effect in health care settings are examples of precautions that could reduce occupational exposure to HDs [6][7]. Studies on adherence of nurses with safe handling of HDs has been reported [8, 9], however limited studies have specified factors that could actually reduce the serious side effects of exposure to HDs. Several factors were known to be the leading cause of inappropriate handling of HDs including lack of knowledge about risk [10], false perceiving of risks, self-efficacy to use PPE [11], and organizational factors [12].

**Purpose**

The purpose of this systematic review is to assess the effects of educational interventions to improve safe HDs handling among oncology nurses.

**Material and Methods**

**Search Criteria and Study Selection**

This review was conducted and reported according to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) guidelines [13]. To answer the research question, PICOT framework was used. The components include Population of interest (P), Issue of interest (I), Comparison of interest (C), Outcome of interest (O), and Time frame (T) [14]. Our review focus on oncology nurses (P), educational intervention to improve safe HDs handling (I), comparison of interest (C) was not relevant. In relation to outcome, it is hypothesized that educational intervention will improve safe HDs handling among oncology nurses in occupational health work (O). The time frame was set to include published articles from the period from 2010 to 2021 (T). The guiding question for the current systematic review is: what are the effects of an educational interventions to improve safe handling of HDs and chemicals among oncology nurses?

The retrieved articles were included if they were: (1) primary research reports, (2) published between 2010 and 2021, (3) related to the effect of educational intervention on safe handling of HDs and chemicals among oncology nurses, (4) written in English, (5) quantitative studies including controlled trials, cross-sectional, quasi-experimental, case-control, and cohort designs. However, (1) Studies before 2010, (2) articles in languages other than English, (3) editorial, reviews, and experts’ reports were excluded. Four nurse researchers conduct the searches in four different databases independently. Cumulative Index of Nursing and Allied Health Literature (CINAHL), Medline through (PubMed), Science Direct, and Google Scholar. The Initial search was started on March 1st, 2021 and the last search was run out on April 1st, 2021.

**Study Coding**

Terms were entered according to medical subject heading (MeSH) to identify research articles. Initially, broad categories were searched such as nurses, health care workers and chemotherapy handling. Then, more specific keywords were searched to include “Hazardous drugs”, “education”, “occupational health” and “oncology nurse”. Additionally, these words were searched in combination with each other to identify other publications. Reference lists of eligible studies were also searched. Two researchers
screened the retrieved articles by titles and abstracts independently, to identify studies that will be included in the review. The full text of studies that were found to be eligible was retrieved and assessed to ensure eligibility. Disagreement over the eligibility of studies was resolved through discussions and by a third reviewer when necessary. Data were extracted by two reviewers using a special extraction sheet developed by researchers. Data were included if consensus was reached between the reviewers.

Analysis

Data were extracted and summarized in two tables: (1) a summary of studies characteristics (including research methodology, interventions, settings, population, results, and recommendations), and (2) studies’ findings that were summarized in a review matrix, with the following headings: author, year and country, title, objectives, design, settings and sample characteristics, findings, recommendations, and additional comments, respectively. Retrieved systematic reviews were assessed using the Critical Appraisals Skills Program (CASP) Checklist [15]. Quantitative studies were assessed using the Quality Assessment Tool (QAT) checklist [16]. Two reviewers assessed the risk of bias in the selected studies independently by using the Effective Public Health Practice Project (EPHPP) [17]. In case of different scores, agreement by all reviewers was achieved. Data were analyzed and synthesized by two reviewers, any disagreement between them was resolved by consensus. data were included only if both reviewers agreed.

Results

A total of (80) articles were retrieved. Fifty-seven remain after removal of duplicates and were screened by titles and abstracts. There were (18) relevant articles that underwent full-text screening of which nine were found eligible to be included in the review.

Risk of Bias within Studies

Trustworthiness checklists were used to assess and appraise the included studies. QAT was used to evaluate the quality of quantitative studies. This was interpreted through referring to the tool dictionary and a research study that examined quality assessment components and rating for EPHPP instrument [18]. Two studies indicate strong and fair on controlling for selection bias. Two studies used randomized clinical trials design, three used quasi-experimental design, and three studies used pre-test post-test. Only one study addresses the confounding variables. One study was blinded. All studies mention the reliability and validity of the data collection tool except for one study. Three studies described the drop-out and withdrawal of participants. Details of appraisal is presented in table 1

<table>
<thead>
<tr>
<th>Table 1: Effective Public Health Practice Project (EPHPP) Quality Assessment Tool for quantitative studies (n=9)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td>1. Selection Bias</td>
</tr>
<tr>
<td>Study 2. Study design</td>
</tr>
<tr>
<td>3. Control for confounders</td>
</tr>
<tr>
<td>4. Blinding</td>
</tr>
<tr>
<td>5. Data Collection Methods</td>
</tr>
</tbody>
</table>
Results of Individual Studies

Nine studies were extracted and included in the current study, they were published between 2013 and 2021. Of those articles, (n=4) had quasi-experimental design, (n=3) used one group pre-post-test design, and (n=2) were randomized control trials. A number of educational interventions were used to improve the safe handling of HDs among oncology nurses. Four studies used multidimensional intervening aids including demonstration and re-demonstration of safe practices of HDs handling, group discussion, seminar, audiovisual aids, and PowerPoint presentations. Two other studies applied safety protocols, and one study used standard educational module.

Identification of commonly used interventional practices to improve safe HDs handling among oncology nurses In the extracted articles, multidimensional interventions were used to improve the safe handling of HDs and cytotoxic agents in occupational health-related work. Mohsen and Fareed [25], conducted a quasi-experimental study, applying a chemotherapeutic safety protocol for a two-month period among oncology nurses (n=63). The participants were assigned to two groups, in two different locations, one group consisting of (n=45) and the other of (n=18) nurses. Both groups received a formal booklet protocol that included information regarding chemotherapy, time of appearance of chemotherapy hazards, and ways of protection during handling, administration, and/or dealing with patient’s excretion. Moreover, the protocol included the way that nurses should deal with drug splashes on the eye or skin and ways of cleaning solid surfaces from chemotherapy contamination.

The second quasi-experimental study that was conducted by Shetaia, Shereif [21], utilized a safety protocol that was composed of four phases; intervention assessment, planning, implementation, and evaluation. The researchers allocated the 45 oncology nurse participants into nine small groups, each group consisting of five nurses, receiving five sessions each lasting from 30 to 45 minutes. Different methodologies were used in each session including chemotherapy preparation, routes of administration, side effects, patient’s preparation before and during the administration of a dose, and precautions and safe handling measures during and after chemotherapy administration.

Keat, Sooaid [20], applied multidimensional pharmacist-based interventions for (n=96) nurses in their prospective interventional study. The interventions included a series of technical, educational, and administrative support measures like the initiation of a closed-system cytotoxic drug reconstitution (CDR) services, courses, training workshops, and guideline updates. Pharmacy CDR service using closed system was initiated during the intervention period. Moreover, cytotoxic drugs were readily prepared in used-form with drug-specific
labels containing clear handling instructions instead of sending it undiluted to the wards. Furthermore, two sessions of continuous nursing education and safe handling of cytotoxic drug workshop were conducted.

Another multidimensional educational intervention study was performed by Aebersold, Kraft [24] used multiple educational approaches such as online modules, in-person interactive sessions, and simulation activities in their paired one-group pre-posttest study. Study participants included oncology registered nurses (n=292) and (n=82) pharmacists.

Two Randomized Controlled Trials (RCTs) applied educational web-based interventions. In the first study that was performed by Friese, Yang [22], the recruited study participants were randomly assigned to the control group (n=136) and intervention group (n=121). The control group received access to an hour of educational module on the project website which summarized principles of safe HDs handling. On the other hand, the intervention group received a tailored intervention of as many as three short videos that addressed the barriers to Personal Protective Equipment (PPE) and an hour of educational module as the control group. Then, the intervention group reported chemotherapy drug spills they experienced during the study period and submitted plasma samples for analysis.

The second RCT study was conducted by Mun and Hwang [19], where they established a content composed of five basic and advanced learning modules for anticancer chemotherapy which are comprehensive cancer diagnosis and treatment, general principles of chemotherapy, chemotherapy drug safety management, intravenous maintenance management, and chemotherapy drug side effect management. The total learning time for those modules was 80 minutes.

Shetaia, Shereif [21] handled a study using one group pre-test and post-test study. Fifty participants were allocated to two groups (n=24, 26) respectively. The educational package was developed according to the identified needs from the pre-test interventions and available literature. After the establishment of base-line data in the pre-test phase, the educational intervention took place using LCD media players as teaching-learning resources. Data were collected after four weeks of the intervention as a post-test intervention.

SAMIR, GARAS [26], conducted a time-series quasi-experimental study to evaluate the effect of a designed teaching program on safe handling of chemotherapy among (n=30) oncology nurses. The study sample was divided into five subgroups, equally, and randomly. The teaching program was implemented on ten sessions that covered both knowledge and related skills of safe handling of HDs. The estimated time for each session was 30 minutes approximately; the total time required for the whole program was 25 hours distributed over 50 days (three days/week). Then, the designed teaching program was implemented through seminars, group discussion, and demonstration/re-demonstration using audiovisual aids such as booklets, videos, and PowerPoint presentations.

In another quasi-experimental study, Crickman and Finnell [23] utilized a toolkit of intervention consisting of hazard identification, standardization of PPE, and education. These strategies were identified as evidence-based control measures to reduce occupational exposure. Standardization of PPE involved selecting gloves, face masks with eye shields, and chemotherapy-tested gowns. Visual tools were used to alert staff about handling of bodily fluids, responding to spills and PPE that is required for chemotherapy administration. Education was offered using an online educational video shared with
all nurses on the oncology unit. The program was created by the researcher himself and lasted around 30 minutes.

Evaluation of the effect of educational intervention on safe handling of HDs among oncology nurses.

Among the selected studies in the current review, the researchers examined the effects of educational interventions to improve safe handling of HDs and cytotoxic agents among oncology nurses. Four studies presented a positive effect and improvement in knowledge and practice regarding the safe handling of HDs \[20, 21, 25, 26\]. Three studies also disclosed increased knowledge about safe handling of HDs \[21, 23, 24\].

According to the result of the RCT study, it was found that web-based self-learning serves as an effective learning strategy to enhance nurses’ safe handling of anti-cancer chemotherapy \[19\]. On the other hand, another RCT study found that web-based interventions did not improve personal protective equipment (PPE) adherence among oncology participants. This is related to suboptimal content in the intervention, too few interactions with participants compared to the actual educational intervention, and such structural barriers to adopting desired behaviors \[22\].

Discussion

Summary of evidence

Seemingly, this review offers a summary of the studies that examined the effects of the educational interventions to improve the safe handling of HDs among oncology nurses. Many studies were conducted in the field of knowledge, attitude, and perception of safe handling of HDs, but little evidence was introduced in relation to the effects of educational intervention on nurse’s compliance with the safe handling of HDs and cytotoxic agents in occupational health-related work. 33.3% of included studies were conducted in the USA \[22-24\]. The same percentage was conducted in Egypt \[21, 25, 26\]. Only one study used a theoretical framework to guide the intervention; however, they haven’t clearly defined how it guided the study, despite the importance of the framework role to develop interventional studies to establish a clear relationship among the variables \[19\]. Most studies (88.9%) revealed a strong association between educational interventions and the safe handling of HDs. However, one study (11.1%) showed that both online and web-based educational interventional courses did not improve participant’s performance. This could be due to suboptimal interventional content, little interaction with participants compared to traditional teaching methods, and structural barriers to achieve desired behaviors \[22, 25\].

44.4% of the extracted studies used multidimensional interventions such as group discussion, seminars, audiovisual aids, online modules, and simulations as a methodology for educational interventions. An example of an effective strategy may be identified through Keat, Sooaid \[20\] study for educational effectiveness to improve safe HDs handling among oncology nurses in Malaysia. It is a pharmacist-based prospective intervention to assess the variation of nurses’ safety related to knowledge, attitude, and HDs handling practice in clinical wards after a series of multidimensional interventions including technical, administrative, and educational measures consisting of institution of closed-system cytotoxic drug reconstitution (CDR), courses, training workshops, and guideline updated. The findings reveal the effectiveness of education and training to improve knowledge on HDs handling, cytotoxic hazardous effect, way of exposure to HDs, use of PPE, and safe handling measures. Moreover, after applying the intervention the results showed improvement of nurses’ attitude towards certain issues related to safety, and confidence levels when handling
HDs. Four studies (44.4%) were longitudinal studies that evaluated the effectiveness of HDs safe handling that were conducted after more than 3 months of educational interventions. This limits the ability to draw conclusions about the sustainability of the intervention’s effectiveness [22, 24, 26, 27]. Another point is that quasi-experimental studies lack randomization which introduces a selection bias that could affect the strength of intervention effectiveness among participants [21, 23, 25, 26]. A single group pre-test and post-test design was applied in 66.7% of studies to assess the effect of educational intervention which may affect the internal validity because of not comparing with oncology nurses who were not exposed to the educational intervention [20, 21, 23, 24, 26, 27].

Limitation

Limitation of the review is the restriction of English language publications, low numbers of enrolled studies according to eligibility criteria, and heterogeneity of the included studies’ design.

Conclusion

Multi-dimensional educational training programs produce strong evidence of positive effects on improving nurses’ knowledge, performance, self-efficacy, attitude, and practice of cytotoxic drug handling. Outcomes include increased compliance with the standard of nurse’s PPE and safety protocol during administration, safety handling measures, drug preparation, transportation, administration, discontinuation, waste disposal, spillage management, and care of safety cabinet. To minimize the risk of HDs exposure, health care workers must receive adequate training and equipment. Policymakers, clinical experts, and health system leaders should encourage clinical settings to adopt updated chemotherapy safety protocols concordant to PPE policies and activities. Further research on technical items and procedures that shape the educational program is needed to identify the structures that have value for clinical results.

Implications for Future Practice, Policy, and Research

Nurses are the front liners using HDs and other cytotoxic agents. They must have adequate knowledge and practice regarding the safe handling of HDs. This could be achieved by establishing a periodic training session including multi-dimensional educational interventions to improve knowledge, practice, and performance of safe handling of HDs. Using PPE to enhance safe workplace climate should be encouraged. Further studies are required to evaluate these interventions implications, contextual factors influencing the outcomes, and clear relationships between intervention components and outcomes.

Evidence-based development of policies should be tackling the barriers that inhibit the effectiveness of educational interventions. More attention should be given to the cost-effectiveness of interventions. Managing the environment is necessary to improve protection of oncology nurses when handling and administrating HDs. Moreover, recognizing inhibiting factors related to incompliance of oncology nurses to the guidance of HDs handling such as high workload, lack of time, unavailability of educational intervention, and infrequent updating of the protocol are recommended.

References

3. Eisenberg, S., A Call to Action for Hazardous Drug Safety: Where We Have Been and Where


22. Friese, C.R., et al. Randomized controlled trial of an intervention to improve nurses’ hazardous


Measurement Instruments for the Stimulation of Children with Autism Spectrum Disorder based on Family Care

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Abstract

Families as a primary place of growth of children with Autism Spectrum Disorder (ASD) are expected to stimulate the development and ability of children with ASD. However, the ability of families in Indonesia to offer stimulation cannot be measured regularly and continuously because there are no standard measurements. This research aims to develop the ability of family-based instruments using a self-care system. The method is divided into two stages: discussion with parents of a child with ASD and manager of an autism center; instrument development (questionnaire). Data analysis uses Lisrel 5.30. The results illustrate that statements in the questionnaire can be used as a measuring instrument in 81.8% of 66 points with validity values from 0.75-0.98, reliability values from 0.666-0.911, and composite reliability of each variable from 0.780-0.932. This study concluded that this questionnaire is appropriate for basic reference measuring the development of autistic children based on family care.

Key words: Autism, family ability, instrument development, self-care

Background

Families are the primary place for autistic children to communicate and interact. Communication for autistic children means informing of the developmental capabilities that have been achieved and the individual needs for the tasks of growth and development. Interacting with an autistic child means connecting with parents and family members continuously every day¹.

Child development tasks are grouped into four categories, namely rude motoric, fine motoric, language, and socialization. Autistic children have growth and developmental tasks according to their age². The rudimentary motoric skills can be identified from the lack of motion. The language skills are known from the use of phrases and expressions to the people around them. Fine motoric and socializations skills should be learned in order to be able to perform and work according to the development stage.

The role of families who have autistic children is to recognize problems that occur in autistic children, make decisions to take appropriate action, care for the child at home, modify the environment for the development of autistic children, and utilize healthcare facilities according to the needs of children with autism. Improvement and empowerment of the family role should be supported by others and help can be provided by professionals or the autism center³.
Efforts to improve the socialization and fine motor skills of autistic children can be stimulated through the family’s role at home and community support as informal education and the autism center’s role as an exclusive education for autistic children. Integrated and programmatic stimulation can improve the development of rude motoric, fine motoric, language, and socializations skills, as an indicator that autistic children can adapt to the environment. The Autism Centre of Blitar city has a parenting education programmed, the purpose of which is to provide information about autistic children’s development ability and to teach families to take action with the help of child skills consultation books.

The Self-Care Deficit Nursing Theory, also known as the Orem Model of Nursing, developed by Dorothea Orem⁴, is the practice of individual activities to sustain life, health, and wellbeing. Individual activity practices are grouped into minimum, partial, and total aid. The purpose of applying the Orem nursing theory to families who have autistic children is so that families can stimulate the development of rude motoric, fine motoric, language, and socializations skills. The stimulation of development by the family can be grouped into minimum, partial, and total aid.

Stimulation of development by families of children with Autism Spectrum Disorder (ASD) who received services in the Autism Centre of Blitar city is based on studies but an instrument for measuring the ability of the family to offer the stimulation does not exist. Instruments should be able to measure the family’s ability and the development of autistic children. Based on the description above, it requires the development of family ability instruments to stimulate the development of children with ASD based on self-care theory.

Objectives

This research aims to develop the ability of family-based instruments using a self-care system.

Material and Methods

The research design was descriptively aimed at the instrument’s development and consisted of two stages. The first stage was the identification of the family’s ability to stimulate and the autistic children’s development based on the perception of the caregiver at the Autism Centre, professionals (psychologist, occupational therapist, speech therapist, and the teacher), and the parents of children with ASD at the Autism Centre of Blitar city. The second stage was to arrange and test the instruments to be used to measure the family’s ability to stimulate the development of children with ASD based on self-care. The second stage involved a population of 40 families who have children with ASD and have received services in the Autism Centre of Blitar city. The first stage sample selection method was purposive sampling and the second stage sample selection method was the total population, with the criterion of not being outside Blitar from July – September 2017. The first stage sample was made up of three managers of the Autism Centre of Blitar city, four professionals, and three parents of children with ASD, and the second stage sample was made up of 40 families. The intervention was done three times each week (August 2017) at the Autism Centre of Blitar city using Fostering Autistic Children Activities at Home (Parent’s Guide) (Bina Aktivitas Anak Autis di Rumah: Panduan Bagi Orang Tua).

The research variables were (1) Autism Centre support involves a parenting education program for parents of children with ASD observed using a consultation book and verified by interview; (2) social support is a form of family activity, including (a) emotional support...
which is empathy given by family members in the home and which includes giving comfort, caring, and confidence to children with ASD, (b) informational support which is a family’s effort to provide information, seek knowledge, advice, and provide feedback on the situation and condition for children with ASD while at home, and (c) instrumental support which is a family’s effort to provide financing, developmental stimulation tools, and food according to the condition of children with ASD while at home; (3) the family’s ability to stimulate development is the act of stimulating after training; and (4) the development of children with ASD lies in the ability to show fine motoric and socializations skills, and communication.

The research framework to develop a family ability assessment tool to stimulate the development of autistic children based on self-care is as below (Figure 1).

Figure 1. A framework of the instrument’s development to support family ability and the development of children with ASD based on self-care nursing theory.

The data collection tool was a questionnaire prepared based on the results of group discussions and of the book *Fostering Autistic Children Activities at Home*. The data collection period was July – September 2017, at the Autism Centre of Blitar city, by the research team. The collected data for the first stage method was a focus group discussion and the second stage involved the family filling out a questionnaire. Data analysis used confirmatory factor analysis and structural equations to assess reliability, validity, and construct reliability.

The analysis used Lisrel (Linear Structural Relation) software. Confirmatory factor analysis was stopped if the t-test value in the validity and reliability test was higher than 1.96 (at alpha 0.05) to obtain the highest GFI.

**Findings**

The results of focus group discussions for this study can be seen in Table 1.
Table 1. The focus group discussion results

<table>
<thead>
<tr>
<th>No.</th>
<th>Focus group discussion materials</th>
<th>The focus group discussions results agreed</th>
</tr>
</thead>
</table>
| 1   | a. Materials used to measure the family’s stimulation ability and the autistic children’s ability.  
b. Method of measuring the family’s stimulation ability and the autistic children’s ability.  
c. Editing of data collection tools based on focus group discussion results.  
d. Data collection executor using questionnaires to measure the family’s stimulation ability and the autistic children’s ability. | Fostering Autistic Children Activities at Home Parent’s Guidebook  
Scale in the range 1 - 4  
Formulated by the researcher.  
Researchers, research teams, and assisted professionals in the Autism Center of Blitar city. |
| 2   | a. Statement of support by the Autism Center of Blitar city  
b. Statement of family support  
c. Statement of the family ability to stimulate the development of autistic children  
d. Statement of autistic children’s development | 6 statements (1 - 4 scale that is Never, Ever, Frequently, and Very Frequently).  
Every family support (emotional, informational, and instrumental) each with 6 statements (1 - 4 scale that is Never, Ever, Frequently, and Very Frequently).  
Family ability to stimulate each development (fine motoric, socialization, and language) each with 8 statements (scale 1 - 4 that is Cannot, Need Help, Can, and Proficient).  
Each development of autistic children’s skills (fine motoric, socialization, and language) each with 6 statements (1 - 3 scale that is Not Able, Need Help, and Able). |
| 3   | Data collection time | According to the visiting schedule of children and families (parents) in the Autism Center of Blitar city. |
| 4   | Development of the statement | Based on the basic questions that have been prepared. |

Table 2. Characteristics of parents (mothers and fathers) and autistic children receiving services at the Autism Centre of Blitar city (n = 40)

<table>
<thead>
<tr>
<th>No.</th>
<th>Characteristics</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Average</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Father’s age (years)</td>
<td>23</td>
<td>63</td>
<td>40.6</td>
<td>7.9</td>
</tr>
<tr>
<td>2</td>
<td>Mother’s age (years)</td>
<td>20</td>
<td>51</td>
<td>35.9</td>
<td>6.8</td>
</tr>
<tr>
<td>3</td>
<td>Parent’s income (IDR)</td>
<td>Not filled</td>
<td>6,500,000</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>4</td>
<td>Autistic children’s age (years)</td>
<td>2</td>
<td>15</td>
<td>6.8</td>
<td>5.4</td>
</tr>
<tr>
<td>5</td>
<td>Birth order</td>
<td>1</td>
<td>3</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>6</td>
<td>Duration of autism (years)</td>
<td>1</td>
<td>7</td>
<td>3.7</td>
<td>2.7</td>
</tr>
</tbody>
</table>
The validity value of variables or sub-variables is less than 0.90, in line with the family income of up to 6,500,000 IDR (Table 2), even the family did not fill in the questionnaire, and supported by the parents were working in the non-formal sector (Table 3). Table 3 illustrates that the highest level of family education (around 60 - 70%) was senior school.

### Table 3. Parents’ characteristics (education and occupation) for autistic children receiving services at the Autism Centre of Blitar city (n=40)

<table>
<thead>
<tr>
<th>No.</th>
<th>Characteristics</th>
<th>Fathers</th>
<th></th>
<th></th>
<th>Mothers</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>f</td>
<td>%</td>
<td></td>
<td>f</td>
<td>%</td>
</tr>
<tr>
<td>1</td>
<td>Education:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Primary school</td>
<td>3</td>
<td>7.50</td>
<td>4</td>
<td>10.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Junior high school</td>
<td>1</td>
<td>2.50</td>
<td>5</td>
<td>12.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Senior high school</td>
<td>21</td>
<td>52.50</td>
<td>20</td>
<td>50.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Diploma</td>
<td>2</td>
<td>5.00</td>
<td>2</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Bachelor / Postgraduate</td>
<td>13</td>
<td>32.50</td>
<td>9</td>
<td>22.50</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Occupation:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Does not work</td>
<td>3</td>
<td>7.50</td>
<td>26</td>
<td>65.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Laborer</td>
<td>4</td>
<td>10.00</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Farmer</td>
<td>3</td>
<td>7.50</td>
<td>2</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Private</td>
<td>11</td>
<td>27.50</td>
<td>5</td>
<td>12.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Entrepreneur</td>
<td>8</td>
<td>20.00</td>
<td>2</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Honorary</td>
<td>2</td>
<td>5.00</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Professional</td>
<td>--</td>
<td>--</td>
<td>3</td>
<td>7.50</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Government</td>
<td>8</td>
<td>20.00</td>
<td>2</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Pension</td>
<td>1</td>
<td>2.50</td>
<td>--</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

The confirmatory factor analysis results for variables and sub-variables are listed in Table 4. Further analysis results from composite reliability between statements and sub-variables’ influence on variables are given in Table 4 and Table 5. This research has 10 parameters (Table 4) so it needs a minimum of 50 samples, but the maximum service capacity of the Autism Centre of Blitar city is 40 children with ASD.

### Table 4. The validity and composite reliability between statements

<table>
<thead>
<tr>
<th>No.</th>
<th>Total of valid statement</th>
<th>Variable / Sub-variable</th>
<th>Validity</th>
<th>Composite reliability</th>
<th>Alpha Cronbach</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4 statements</td>
<td>AutismCentre of Blitar city support</td>
<td>0.98</td>
<td>0.827</td>
<td>0.740</td>
</tr>
<tr>
<td>2</td>
<td>5 statements</td>
<td>The family emotional support</td>
<td>0.92</td>
<td>0.780</td>
<td>0.650</td>
</tr>
<tr>
<td>3</td>
<td>6 statements</td>
<td>The family informational support</td>
<td>0.96</td>
<td>0.880</td>
<td>0.834</td>
</tr>
</tbody>
</table>
### Table 4. The validity and composite reliability between statements

<table>
<thead>
<tr>
<th>No.</th>
<th>Statements</th>
<th>Description</th>
<th>Coefficient value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6 statements</td>
<td>The family instrumental support</td>
<td>0.88</td>
</tr>
<tr>
<td>2</td>
<td>4 statements</td>
<td>The parent stimulation of fine motoric ability for children with ASD</td>
<td>0.96</td>
</tr>
<tr>
<td>3</td>
<td>4 statements</td>
<td>The parent stimulation of socialization ability for children with ASD</td>
<td>0.94</td>
</tr>
<tr>
<td>4</td>
<td>8 statements</td>
<td>The parent stimulation of language ability for children with ASD</td>
<td>0.75</td>
</tr>
<tr>
<td>5</td>
<td>5 statements</td>
<td>The fine motoric ability of children with ASD</td>
<td>0.96</td>
</tr>
<tr>
<td>6</td>
<td>6 statements</td>
<td>The socialization ability of children with ASD</td>
<td>0.86</td>
</tr>
<tr>
<td>7</td>
<td>6 statements</td>
<td>The language ability of children with ASD</td>
<td>0.85</td>
</tr>
</tbody>
</table>

### Table 5. The coefficient values for sub-variables to variables and between variables

<table>
<thead>
<tr>
<th>No.</th>
<th>Name of sub-variable and variable</th>
<th>Coefficient value</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Autism Centre of Blitar city support → The family social support</td>
<td>0.327</td>
</tr>
<tr>
<td>2</td>
<td>Autism Centre of Blitar city support → The parents’ stimulation ability</td>
<td>0.323</td>
</tr>
<tr>
<td>3</td>
<td>Autism Centre of Blitar city support → The children with ASD’s ability</td>
<td>-0.174</td>
</tr>
<tr>
<td>4</td>
<td>The family’s social support → The parents’ stimulation ability</td>
<td>-0.058</td>
</tr>
<tr>
<td>5</td>
<td>The family’s social support → The children with ASD’s ability</td>
<td>0.169</td>
</tr>
<tr>
<td>6</td>
<td>The parents’ stimulation ability → The children with ASD ability</td>
<td>0.792</td>
</tr>
<tr>
<td>7</td>
<td>The family’s emotional support → The family social support</td>
<td>0.744</td>
</tr>
<tr>
<td>8</td>
<td>The family’s informational support → The family social support</td>
<td>0.917</td>
</tr>
<tr>
<td>9</td>
<td>The family’s instrumental support → The family social support</td>
<td>0.872</td>
</tr>
<tr>
<td>10</td>
<td>The fine motoric ability of children with ASD → The children with ASD’s ability</td>
<td>0.794</td>
</tr>
<tr>
<td>11</td>
<td>The socialization ability of children with ASD → The children with ASD’s ability</td>
<td>0.863</td>
</tr>
<tr>
<td>12</td>
<td>The language ability of children with ASD → The children with ASD’s ability</td>
<td>0.827</td>
</tr>
<tr>
<td>13</td>
<td>The fine motoric ability stimulation → The parents’ stimulation ability</td>
<td>0.817</td>
</tr>
<tr>
<td>14</td>
<td>The socialization ability stimulation → The parents’ stimulation ability</td>
<td>0.781</td>
</tr>
<tr>
<td>15</td>
<td>The language ability stimulation → The parents’ stimulation ability</td>
<td>0.849</td>
</tr>
<tr>
<td>16</td>
<td>Autism Centre of Blitar city support → The children with ASD’s ability (indirect influence)</td>
<td>0.296</td>
</tr>
</tbody>
</table>
Discussion

Confirmatory factor analysis (CFA) is a powerful statistical technique for the development of measurement instruments. CFA is based on developing an instrument that begins with composing a written question, determining the scale, trialing the instrument, collecting the data, and finally performing analysis using CFA. CFA identifies the structure of the instrument or what the researcher thinks. CFA allows researchers to test the hypothesized relationship between observed indicators and construct latent variables. The researcher uses theoretical knowledge, postulates the a priori relationship pattern, and then tests the hypothesis between the indicator and the latent variable statistically.

The use of CFAs may be affected by (1) the research hypothesis being tested, (2) sufficient sample size requirements (e.g., 5-20 cases per approximate parameter), (3) measurement instruments developed, (4) multivariate normality, (5) identification of parameters, (6) outliers, (6) missing data, and (7) model fit interpretation according to the model. The approaches taken in CFA are (1) reviewing relevant theory and literature for the instrument development, (2) determining indicators and latent variables for testing, (3) determining parameters, (4) conducting preliminary descriptive statistical analysis, (5) estimating parameters in the model, and (6) assessing the fitness of the model.

Assessment of CFA conformity used GFI. GFI statistics were created by Jöreskog and Sorbom as an alternative to the Chi-Square test and calculate the proportion of variance recorded by population covariant estimates. The variance and covariance recorded by the model show how closely the model replicates the observed covariance matrix. The CFA model from Lisrel notes that the model focuses only on the relationship between observed variables and their underlying factors. The CFA model is only related to the way observed measurements are mapped to a particular factor, and not causal relationships between factors; this model is called the measurement model. CFA was stopped if, after re-analysis, reducing the indicator/question indicator resulted in a t-test value for each validity and reliability value of more than 1.96, but if conformity of the GFI decreased, then the value before the retest was done was used. GFI is based on the ratio of the number of quadratic differences to the observed variance (for the smallest common squares). The GFI ranges between 0 and 1, with values greater than 0.9 indicating a good match with the data. GFI is analogous to multiple quadratic correlations because it shows the observed covariance proportions described by the covariance model.

Composite Reliability (CR) is also referred to as the McDonald’s coefficient, obtained by combining all actual variance scores and covariance in a combination of indicator variables related to construction; then, this number is divided by the total variant on the composite. Composite reliability refers to the accuracy with a scale or instrument that assesses a dimension. Reliability is defined as the proportion of variance in observed test scores associated with actual scores. Reliability is shown by double-scale management. Measurements taken twice cannot expect to get the same score but the closer the first score corresponds to the second score, the higher the reliability. Thus, reliability refers to the reproducibility of scores from measuring devices. Based on the classical test theory of three sources of variance: (a) the variance of the true score, (b) the variance of error (or measurement error), and (c) the total scale variance (which is the actual
The number of scores and the variance error) this can be used as a result for reliability.

The sample size in this research is 40 samples and is categorized as a saturated sample because the observation involved all members of the population, namely families and children with ASD who received services at the Autism Centre of Blitar city. The sample size to estimate the parameters is between 5:1 and 10:1. The number of samples can be easily calculated using the formula 

$$\text{Sample size} = \frac{v}{v+1}$$

where $v$ is the many variables observed.

The validity values for the variables or sub-variables measured in this research are low (less than 0.90): family instrumental support at 0.88; family ability to stimulate the language at 0.75; socialization ability of the children with ASD at 0.86, and the language ability of children with ASD at 0.85. However, the value of the validity for PLA support, family emotional support, the family’s informational support, the family’s ability to do fine motor stimulation, the family’s ability to stimulate socialization, and the fine motor abilities of children with ASD have a value greater than 0.90. This factor enables the family to not meet the children’s instrumental needs for supporting the development of the children with ASD. Hurlock writes that the development of children is a factor that should receive attention and the improvement of the child’s ability needs to be stimulated by the use of tools.

The highest validity value is for the Autism Centre support variable. The value is very reasonable because the Autism Centre of Blitar city, as a service provider for autistic children, has sufficient resources supported by the Government of Blitar City and the Ministry of Education and Culture of the Republic of Indonesia (RI). The form of Blitar City Government support is the provision of a building and routine operational financing. The form of support from the Ministry of Education and Culture of RI is the provision of means for the development of stimulation equipment for children with ASD and professional instructors to train regularly three times a year. Human resources owned by the Autism Centre of Blitar city are professionals in the field of educators, speech therapists, occupational therapists, water therapists, behavioural therapists, and psychologists. These professionals have academic skills and are equipped with training related to educating children with ASD. Also, the Autism Centre of Blitar city has a standard built into the service, so it is not influenced by the input of parents and children with ASD. The early stage of the service for children with ASD always assesses the ability of the children. Periodically, every three months, a parenting education programmed about the behaviour of parents or family is offered for children with ASD.

Family social support includes emotional, informational, and instrumental support but these cannot work alone because the three things are interrelated to meet the development of children with ASD. A validity value for the family’s emotional and informational support over 0.90 illustrates that the family gives good emotional support to children with ASD in the family and seeks to find appropriate information to meet the needs of the children. Suprajitno writes that the
family has five tasks in health care, namely to recognize the changes in the child’s health, decide to choose appropriate efforts, care for the child while at home, modify the safety of the home environment for the child, and use appropriate health care facilities for the child. Emotional and informational support for children with ASD is consistent with family tasks because families must meet the needs of children, not just growth needs, but also developmental. Another reason is that children are part of the family and, according to Mugianti, caring for family members who have health problems includes sincerity, love, and finding the appropriate healthcare facilities.

The validity values for the parents’ ability to stimulate fine motor and socialization skills for children with ASD and motor skills of children with autism have values of more than 0.90. This factor illustrates that the family can provide and stimulate the child at home. Orem’s nursing care is best used to make families nursing care agents for children with ASD because the children’s needs, including development, are unlikely to be met by healthcare facilities at any time in the long term. The principle of nursing care is to establish a family (as a target) so as not to depend on nurses or professionals for the development of children with ASD. The theory reveals that the fulfillment of the most favorable developmental stimulation is done by the family at home, and family is the first and the main place in the child’s life. Families have more time to meet with children and meet the needs of children with ASD. Independent stimulation must be done by parents because the family plays an important role in the child’s life.

According to Cohen et al., measuring and assessing social support is unique because there is a unique relationship between giving and receiving support (for parents and children with ASD). Support received from the Autism Centre of Blitar City serves to help parents cope with the needs of children with ASD. The form of support from the Autism Centre of Blitar city is a monthly parenting education programmed and consultation about how the development of children with ASD can be identified by parents.

**Conclusion**

Indicators of variables found are: (1) the Autism Centre of Blitar City support includes parent education programmed, information on children’s educational activities in the coming week, children’s most recent abilities, and child development; (2) family social support relates to child protection, information for other families, encouragement, educational programmed, information on how to stimulate a child, a comfortable environment, sourcebooks, stimulation tools, information on use of tools, storage of tools, and repair of tools; (3) the family’s ability to stimulate a child in terms of upper and lower limbs, facial movement, sharing toys with other children, reading, arithmetic, writing, singing, imitating, and concentration; and (4) the development of children with ASD goes hand in hand with that of other children such as in relation to following orders, helping other children, naming friends and using sentences.

Overall, the statements in questionnaires that were valid and reliable and can be used as a measuring instrument totaled 54 (81.8%) from 66 statements with a validity value ranging from 0.75 to 0.98, a reliability value ranging from 0.666 to 0.911, and composite reliability of each variable ranging from 0.780 to 0.932. The indirect effect of PLA support on the abilities of autistic children is 0.296 and the direct influence of each variable on other variables is from 0.058 to 0.917.
**Suggestion**

Questionnaires can be used to measure the ability of parents to stimulate the development of children with autism as a basis for efforts to improve the ability of the family to support their child.

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**Ethical Clearance**: Ethical clearance was given by the Health Research Ethics Commission of PoltekkesKemenkes Malang, Registered Number: 304/KEPK-POLKESMA/2017 dated July 6, 2017.

**References**


The Case Study of Heart Disease at Urban and Rural Communities by Gender and Age in Indonesia in 2018

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¹Health Researcher, The Center of Research and Development For Humanities and Health Management, Ministry of Health, Republic of Indonesia

Abstract

Introduction: Heart disease is a community health problem. It is expensive to care and cure and leading cause of death in Indonesia. The research aimed to analyze relationship and magnitude of the risk of exposure of heart disease in urban and rural communities according to age and sex factors. Methods: It was quantitative research with cross sectional design. Data came from Indonesia Basic Health Research at 2018 with all household as population. Sample were individuals aged ≥ 15 years. It used chi square and estimate risk analysis. Results: Heart disease was higher in urban areas, especially 54.6% women were more exposed to heart disease than 45.4% men. Also elderly group was the highest (65.8%) than other group. There were 66.7% elderly men and 65.0% women risk to exposed heart disease than other groups. There was a significant relationship between gender, age and region with heart disease cases. The exposure risk of heart disease for men in urban areas were 1.4 times greater than rural. The urban elderly group were 1.9 times greater than rural. The urban elderly men group were 2 times greater than rural. The urban elderly women group were 1.8 times larger than rural. Conclusion: Heart disease in urban areas was higher than rural areas. Women had more risk of heart disease. Elderly women group had highest risk than other age groups.

Keywords: Heart disease, urban, rural, women, men, elderly

Introduction

Heart disease is a non-communicable disease caused by heart and blood vessel disorders.¹ It occurs in urban and rural communities. It is still the leading cause of death after stroke and hypertension in Indonesia.² Heart disease is the number 1 killer disease in the world. It has also begun to trend towards a younger age, especially in groups who have low physical activity, which mostly occurs in urban communities.³,⁴ In the United States, it reached 43.8% deaths.⁵ Poland was classified as a country with CVD high-risk mortality (i.e., CVD deaths > 450/100,000 in men and> 350 / 100,000 in women).⁶ Mortality in rural areas was higher than in urban areas.⁷,⁸ Male deaths were more height than female.⁶ The prevalence of heart disease among the rural poor was still quite high.⁹ Risk factors in middle-income countries have increased markedly due to the way of working and the transition to sedentary, abusive, and greedy lifestyles.¹⁰

The quality life of a person was influenced by age and sex because older person would have the lower the body’s function both physically and psychologically.¹¹ Male tended to have better body functions than women.¹²

In addition, heart disease in Indonesia is still difficult to overcome. It is due to decentralization policies and the low commitment of local governments, unequal health development between provinces in dealing with heart disease and low community independence in preventing heart disease.¹³,¹⁴,¹⁵
People still have not abandoned their health risky eating behavior in urban and rural areas. It makes many obesity, diabetes and hypertension that lead to heart disease.\textsuperscript{16,17} This research focused on exploring the relationship and the magnitude of the risk of exposure to heart disease in urban and rural areas by age and sex groups. This study aimed to analyze the relationship and the magnitude of the risk of heart disease exposure in urban and rural communities according to age and sex in Indonesia in 2018.

**Methods**

This research obtained ethical permission from the ethics commission of the National Institute Of Health Research and Development, Indonesian Ministry of Health. The ethics permit number was LB.02.01/2/KE.024/2018. It was a quantitative research with a cross-sectional design. The independent variables were gender, age and region. The dependent variable was heart disease (with answer 1 yes and 2 no). All methods were carried out in accordance with relevant guidelines and regulations. Informed consent was obtained from all participants. If participants were under 18, we got it from parent and or legal guardian.

This research analyzed relationship with chi square test at the level of trust (Confident Interval/CI) 95\% and the significance level p < α (5\%). This article also presented a risk estimate analysis or Odds Ratio (OR). It aimed to measure associations of heart disease exposure (risk factors) between urban and rural communities. The population was all households in all provinces in Indonesia (34 Provinces and 514 districts/cities), 12,915 urban, 17,085 rural. The total sample were 25,000 households. The samples were individuals aged ≥ 15. The unit of analysis was the household.

Nominal scale of independent variables were area of residence (urban : code 1 and rural : code 2), sex (male code 1 and female code 2), age. Age was based to the Ministry of Health categorical age. It was adolescents (code 1 : age 12-25 years), adults (code 2 : ages 26-45 years), elderly (code 3 : aged 46-65 years) and seniors (code 4 : age> 65 years). The dependent variable was heart disease (code 1 : “Yes” and code 2 : “No”). Based on the 2018 Riskesdas guidelines, heart disease was abnormalities in the heart such as coronary heart disease, heart failure (decompensation cordis), valve abnormalities, swelling of the heart muscle. It has been diagnosed by a doctor or clinically. It was characterized by chest pain or discomfort in the chest or heavy chest. Heavy chest was chest feels heavy when it was climbing/ heavy work or walking in a hurry when walking on flat roads or walking long distances.\textsuperscript{18}

The data source came from the results of Basic Health Research (Riskesdas) in 2018. Riskesdas 2018 was a type of survey research. The calculation of the sample was according to the Susenas sample. Susenas was carried out by the Indonesian Central Statistics Agency (BPS). It used PPS (probability proportional to size) with linear systematic sampling. It was two Stage sampling.

The data analyzed was the result of weighting (weight case) by BPS, so that the number of respondents analyzed was 193,126,723 people with 96,248,062 males and 96,878,661 women. Male live in urban areas were 53,221,996. Men live in rural areas were 43,026,066. Women live in urban area were 53,611,787. Women live in rural areas were 43,266,874.

**Results**

Riskesdas 2018 specifically asked cases of heart disease in the community, so that the latest cases in the community could be known. The research found that people who were not exposed to heart disease ≥ 97.8\% and those exposed to heart disease were only ≤ 2.2\%. They were from adolescence (age 15
years) to seniors (age > 65 years). Based on their place of residence, the cases of heart disease in urban communities were 61.5% and in rural communities were 38.5%. In urban area, the number of women who were exposed to heart disease reached 60.8%, which was higher than those who live in rural areas. In urban area, the number of men who were exposed to heart disease reached 62.5%, which was higher than those who live in rural areas.

![Figure 1: Heart Disease Cases in Men and Women by Area of Residence (Urban and Rural) in Indonesia in 2018](image1)

Based on figure 1, in urban communities, it showed that women who were exposed to heart disease were 54.6%. It was higher than men. Men who were exposed to heart disease only 45.4%. Older people were more at risk of developing heart disease. In urban communities, the senior group (age > 65 years) was the highest group (65.8%) exposed to heart disease. The elderly group (age 45-65 years) was second group (63.6%) exposed to heart disease.

![Figure 2: Heart Disease Cases Based on Age Group and Residence Area](image2)

Based on figure 2, adolescents were the lowest age group exposed to heart disease in urban area, the male in senior group were 66.7% exposed to heart disease. It was the highest group exposed to heart disease. The women in senior group were 65.00% exposed to heart disease. It was the second group.
Based on figure 3, correlation analysis (Chi Square test) between independent variables (age, sex and area of residence) and dependent variable (heart disease) showed a significant relationship $p < \alpha$ (0.005). The results of the estimated risk (Estimate Risk or Odds Ratio (OR)) showed as follows:

Table.1. Significance Value and Estimated Risk (OR) of Heart Disease by Gender, Age and Area of Residence

<table>
<thead>
<tr>
<th>No</th>
<th>Variabel</th>
<th>Residence</th>
<th>Diagnosis</th>
<th>Total</th>
<th>Sig ($p &lt; \alpha$)</th>
<th>OR</th>
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<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
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<td>Sex</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
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<td>971780</td>
<td>52250216</td>
<td>53221996</td>
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<tr>
<td></td>
<td>Men</td>
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<td>43026066</td>
<td></td>
</tr>
<tr>
<td>2</td>
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<td>1170964</td>
<td>52440823</td>
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<tr>
<td></td>
<td>Women</td>
<td>rural</td>
<td>756033</td>
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</tr>
<tr>
<td>B</td>
<td>Age Group</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Adolescent</td>
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<td>26582773</td>
<td>26775322</td>
<td>0,000</td>
</tr>
<tr>
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<td>20350190</td>
<td>20493099</td>
<td></td>
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<tr>
<td>4</td>
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<td>44951956</td>
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</tr>
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<td></td>
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<tr>
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<td>594037</td>
<td>23208640</td>
<td>23802677</td>
<td></td>
</tr>
</tbody>
</table>
Based on table 1, the risk of exposure to heart disease in men who lived in urban areas was 1.4 times greater than those who live in rural areas. The risk of exposure to heart disease in women who lived in urban areas was 1.3 times greater than those who live in rural areas. The risk of having heart disease based on age showed that the older person, both men and women, was the greater the risk of developing heart disease. The senior group in urban area was a group that has a risk of exposure to heart disease by 1.9 times higher risk than those living in rural areas. The risk of exposure to heart disease based on sex and age showed that elderly men in urban areas had 2.00 times higher risk of heart disease than those who live...
in rural areas. Elderly women in urban areas had 1.8 times higher risk of heart disease than those who live in rural areas. In general, people in urban areas had a higher risk of heart disease than those who lived in rural areas. It was especially for women. The older person was more risk to exposed of heart disease.

**Discussion**

Heart disease had a significant relationship with population demographic factors, such as age and gender. Currently, heart disease is found in both urban and rural areas. Men and women who lived in urban areas experience higher cases than those who lived in rural areas. The results of the risk estimation or odds ratio (OR) showed that men and women who lived in urban areas have a greater risk of developing heart disease than those who lived in rural areas. According to several articles, it was caused by differences in the eating patterns of urban and rural communities. It was very influential to trigger heart disease cases. The diet of urban communities caused more cases of obesity, diabetes, and lack of physical activity, less balanced nutrition, and air pollution. Apart from that, unhealthy dietary behavior in urban communities could trigger heart disease. The smoking habit of urban communities was also a trigger for high cases of heart disease in urban areas. High-intensity working behavior in cities could triggers stress to heart disease. Low physical activity in urban communities is caused of using more modes of transportation for activities outside the home such as going to the market, to offices and other activities.

The results of the 2018 Riskesdas showed that urban people ate more foods that were risky to health, such as eating fatty/cholesterol foods more than once a day reached 43.6% while rural people only 39.5%, eating salty food more than once a day reached 30.5% while the rural community was only 28.7%, eating sweet food more than once a day reached 62.02% while the rural community was 60.37%, and the proportion of eating meat, chicken, processed fish with preservatives was more than once a day in urban communities it reached 5.5% while in rural communities it was only 4.1%. Due to a health risk diet, urban people were more obese than rural communities and cases of hypertension in urban areas. The proportion of urban people experiencing obesity was 42.9% and almost half of the adult urban population was obese.

Heart disease cases had a significant relationship to gender (p < α (0.005)). Odd ratio value of heart disease cases in urban women was higher than men. These findings were in line with the results of another research which states that in the last 10 years, heart disease has been found to be higher in women who live in cities. The high number of heart disease cases in women was because more women were obese, diabetes and hypercholesterolemic. than men. The prevalence of heart disease and tumors was higher in women. Women were more susceptible to heart disease and stroke.

This study also analyzed the relationship between age and the occurrence of heart disease cases. Statistically it was found that there was a significant relationship p (0.000) < α (0.005) between the variation in the age group and heart disease. Heart disease was more common in the senior group than elderly, adults and adolescents. This was in line with another study which states that heart disease was more prevalent in older age groups, especially those living in urban areas, and the older person is more risk of developing heart disease.

The aging factor could have a significant effect (p value = 0.001) in reducing the quality of life. The older person would experience an increase in total cholesterol levels, an increase in excess fat content which results in metabolic syndrome, thus increasing the risk of heart disease. Aging factor influenced the
function of the heart, such as: decreasing elasticity and widening of the aorta, thickening and stiffness of the heart valves, increasing connective tissue. It is resulting in heart failure in the elderly. According to one article, that men aged > 45 years were at risk of developing heart disease.

**Conclusion**

Heart disease was significantly affected by place of residence (urban and rural), sex and age group. Urban communities had higher risk of heart disease exposure than rural communities. In urban communities, women showed a higher risk of heart disease exposure than men.

In the age group, the older people had higher risk of developing heart disease. The group of seniors (> 65 years) who lived in urban areas had a risk of heart disease exposure 1.9 times than group of seniors who lived in rural areas. Elderly men (46-65 years) who lived in urban areas had a risk of heart disease exposure 2 times than group of elderly men who lived in rural areas. Elderly women (46-65 years) who lived in urban areas had a risk of heart disease exposure 1.8 times than group of elderly women who lived in rural areas. Men and women in adolescents (age 12-25 years) group who lived both in urban and rural areas had the lowest risk of heart disease exposure.

**Suggestion**

Heart disease affect more urban communities, especially women and the elderly. It is also important to watch out adolescents group because they become a part of being exposed to heart disease. Therefore, it is time for the local government and the communities to support government policies in controlling heart disease prevention. It is through increasing community participation in a clean, healthy lifestyle, avoiding health-risky diets and increasing physical activity through regular exercise. It must include all age group. In addition, it is important for local governments to optimize the implementation of the decentralization policy in the health sector in the prevention of heart disease in Indonesia.

**Declarations**

**Ethics Approval and consent to Participate**

This Manuscript get ethics approval from National Institute of Health Research and Development, Indonesian Ministry of Health. The ethics permit number was LB.02.01/2/KE.024/2018.

**Consent for Publication**

As another health scientific research, enumerator get consent to participate and consent for publication from respondents. Enumerator must read informed consent to the respondents. Before enumerator collect data, respondents must agree by signing in the form of “Approval (Interview) After Explanation”.

**Availability of Data and Materials**

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request. All data generated or analysed during this study are included in this published article.

**Competing Interest**: We do not have any competing interests.

**Funding**: Our Institution, Indonesian Ministry of Health, did this research. There are not any funding in making this article.

**Author’s Contribution**

All the author work together. We have equal contribution. All of us are the main contributors.

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Effect of Community Characteristics and Diseases due to Metabolic Disorders on Heart Disease in Indonesia

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¹Health Researcher, The Center of Research and Development For Humanities and Health Management Ministry of Health, Republic of Indonesia

Abstract

Introduction: Heart disease is still a global health problem and the highest cause of death in Indonesia. This study aims to analyze the influence of demographic factors and metabolic disease on heart disease.

Method: It is quantitative research with cross-sectional design. The data came from the results of the 2018 Basic Health Research survey. Data analysis uses logistic regression. The population was all households in Indonesia. The sample was population aged 15 years.

Results: Community characteristics and metabolic disease factors significantly affected the P value of the Wald’s test (Sig) < 0.05. Based on the value of Nagelkerke R Square (Pseudo R-Square), demographic factors have an influence of 3% and metabolic disease factors have an influence of 6% on heart disease.

Conclusion: Community characteristics and metabolic disease factors have a significant effect on heart disease. Therefore, it is necessary for health workers to socialize government policies regarding guidelines for preventing heart and blood vessel disease correctly and comprehensively.

Keywords: Heart, Demography, Metabolic, Indonesia
Metabolic diseases such as hypertension, diabetes mellitus (DM), and stroke belong to deadly diseases other than heart disease and cancer. Stroke ranks third as deadliest disease after heart disease\(^9\). Patients with DM risk 2 to 4 folds to have heart disease\(^10\); and hypertensive persons risk 2.7 folds higher to have heart disease. Today, heart disease is no longer specific to find in elderly aged \(>60\) years old but, but now it has attacked under 40 years to 15 years, this is due to modern lifestyle patterns such as consuming fast food\(^6\)\(^11\)\(^12\).

Based on the description above, that heart disease as a deadly non-communicable disease. However, it can be prevented by doing control and knowing the risk factor heart disease. Therefore it is crucial problem to conduct a study to analyze the effect of demographic factors and metabolic disease on heart disease in Indonesia. This research aimed to analyze the effect of demographic and metabolic disease on heart disease in Indonesia.

**Metode**

**Data Source**

The study employed secondary data from the 2018 Indonesian Basic Health Survey. The 2018 Indonesian Basic Health Survey was a cross-sectional survey at the national level.

**Variables**

The limitation of analysis and discussion in this study is to only use data on community characteristics such as: age, latest education, and employment. The study also employed metabolic disease (stroke, hypertension, and diabetes mellitus) and heart disease as variables. The dependent variable was heart disease with a nominal scale where code response 1 = Yes (suffering), and 2 = No. Respondents who suffer a stroke, hypertension, and diabetes mellitus diseases also have a nominal scale (code 1 = Yes (suffering), code 2 = No (Not Suffering). Gender is coded by 1 = male and 2 = female. According to WHO, age category refers to age division where 1 = elderly aged \(\geq 60\) years old and 2 = non-elderly (15 to \(< 60\) years old). Education was coded by 1 = higher education (respondents have higher education certificate at least D1 and up to a doctoral degree) and 2 = senior school schole and under. Workers is coded by 1 = working in the governmental institution (Civil Servant, Military, Police, State Owned Company) and 2 = private-sector workers.

Definition of heart disease, stroke, hypertension, and diabetes mellitus refers to the 2018 Indonesian Basic Health Survey research guide. Heart disease is defined as all abnormality in heart including coronary heart, heart failure (decompensatio cordis), valve abnormality, heart muscle swelling etc that are diagnosed by general. Stroke is defined as failure in brain characterized by sudden, progressive and fast appearance due to non traumatic impeding blood circulation in brain. Hypertension or high blood pressure is defined as condition where blood pressure in arteries is chronically higher than normal. Diabetes mellitus is defined as metabolic disease with set of symptoms which occur due to increased blood glucose beyond normal value\(^13\).

**Data Analysis**

The study analyzed data by binary logistic regression since the dependent, becouse independent variables have a nominal scale, with confident Interval (CI) was 95%, and significance degree \(\alpha 5\%\). \(H_0\) would be rejected if the variable in the equation table showed \(p\)-value of wald test (Sig) \(< 0.05\), indicating that each independent variables has significant effect on Y (dependent). The effect rate was shown by EXP \(\beta\) or odds ratio (OR) and direction of effect is based on Beta Natural Algorithm Analysis (\(\beta\)) result.
Ethical Approval

The 2018 Indonesian Basic Health Survey Ethic has passed the ethical test. The 2018 Indonesian Basic Health Survey Ethic received ethical clearance from the National Institute of Health Research and Development, the Republic of Indonesia’s Ministry of Health (No LB.02.01/2/KE.024/2018).

Results

Total respondents (n) are 193,126,724, who suffer from heart disease due to demographic and metabolic factors as follows:

Table 1. Percentage between healthy individuals and those who suffer heart disease according to community characteristics and metabolic data

<table>
<thead>
<tr>
<th>Variables</th>
<th>Heart Disease</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No</td>
<td>Yes</td>
<td>*p-value</td>
<td></td>
</tr>
<tr>
<td>Community characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Gender</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Male</td>
<td>98.2</td>
<td>1.80</td>
<td>0.000</td>
<td></td>
</tr>
<tr>
<td>• Female</td>
<td>49.03</td>
<td>0.80</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Age group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• 15 – 59</td>
<td>87.16</td>
<td>1.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• ≥ 60</td>
<td>11.04</td>
<td>0.52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Education Level</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Senior high school and under</td>
<td>89.73</td>
<td>1.62</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Higher education</td>
<td>8.47</td>
<td>0.18</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Work type</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Governmental institution</td>
<td>95.28</td>
<td>1.72</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Privat sector</td>
<td>2.92</td>
<td>0.08</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Penyakit Metabolik</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Hypertensi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No</td>
<td>91.0</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Yes</td>
<td>7.2</td>
<td>0.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Diabetes Mellitus</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No</td>
<td>96.3</td>
<td>1.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Yes</td>
<td>1.9</td>
<td>0.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Stroke</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• No</td>
<td>97.2</td>
<td>1.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Yes</td>
<td>1.0</td>
<td>0.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: n sample are 193,126,724, *p < α (0.05); Confidence Interval (CI) 95%.
Based on demographics, the highest heart disease rate is found in women, with a prevalence of 1.00% compared to men, who have 0.80%. Age group <60 years old has a 1.28% incidence, while the age group ≥ 60 years old has a 0.53% incidence. Among education levels, high school and under have a 1.62% incidence, while respondents who work in private sector have a 0.08% incidence. Heart disease is more common in urban communities, with females, age <60, not graduating from college, and government employees. Based on table value of variable in the Equation, respectively show P value of Wald test (Sig) < 0.05. Nagelkerke R Square value (Pseudo R-Square) 3%, hence demographic factors have 3% effect on heart disease incidence.

Analysis in three metabolic diseases suffered by respondents (n=193,126,724) showed 10.9% from total respondents who suffer illness like hypertension 7.7%, but those who have heart disease 0.5%, diabetes mellitus 2.1% and those who have heart disease 0.2%， and stroke 1.1% and those who have heart disease 0.1%, while respondents without these diseases metabolic were 89.1%. Highest metabolic disease to cause heart disease is hypertension with 0.5% followed by diabetes mellitus of 0.2% and the lowest is stroke with 0.1%. The percentage of heart disease is greater in respondents with hypertension, diabetes mellitus and stroke. The effect of metabolic disease factors on heart disease, according to the table value of Variables in The Equation, each of which shows the P value of the Wald test (Sig) < 0.05. The value of Nagelkerke R Square (Pseudo R-Square) is 6%, so that demographic factors have a 6% influence on the occurrence of heart disease.

Analysis result binary logistic regression to total respondents (n=193,126,724) among heart disease patients with the factors that influence both according to demographic factor group and metabolic deseases group, the result as follows:

Table 2. The results of binary logistic regression, between heart disease with the community characteristics and metabolic factors.

<table>
<thead>
<tr>
<th>Predictors</th>
<th>Heart Disease</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>p-value</td>
<td>Exp (β) (Odd Ratio / OR)</td>
</tr>
<tr>
<td>Gender (female with male)</td>
<td>0.000</td>
<td>1,221</td>
</tr>
<tr>
<td>Age (ages ≥ 60 years old with 15-59 years)</td>
<td>0.000</td>
<td>3,353</td>
</tr>
<tr>
<td>Education (higher education with senior high school and under)</td>
<td>0.000</td>
<td>1,140</td>
</tr>
<tr>
<td>Workers type (Governmental institution with privat sector)</td>
<td>0.000</td>
<td>1,607</td>
</tr>
<tr>
<td>Between hypertension with no hypertension</td>
<td>0.000</td>
<td>3.392</td>
</tr>
<tr>
<td>Between diabetes Mellitus:with No diabetes Mellitus</td>
<td>0.000</td>
<td>3.103</td>
</tr>
<tr>
<td>Between stroke with No stroke</td>
<td>0.000</td>
<td>2.044</td>
</tr>
</tbody>
</table>

Note: n sample are 193,126,724, *p < α (0.05); Confidence Interval (CI) 95%.
Community characteristics factors according to gender, age, education, and work group that shows significant effects \(p < \alpha (0.05)\) with Confidence Interval (CI) 95%. Gender effect between female and male shows EXP \(\beta\) is 1.221 with CI 95% (1.218-1.224), so that female has heart disease risk 1.221 time higher than male. Age factor effect between \(\geq 60\) years old with 15-59 years old shows the result of EXP \(\beta = 3.353\) and CI 95% (3.345-3.361), so that \(\geq 60\) years old are more at risk of heart disease 3.43 fold higher than 15-59 years old. Education factor between higher education with senior high school and under has EXP \(\beta = 1.140\) and CI 95% (1.136-1.145), so that the individuals with higher education have heart disease risk 1.14 fold higher than senior high school and under background. Workers factor between Governmental institution and privat sector has EXP \(\beta = 1.607\) and CI 95% (1.598-1.616), so that working in governmental institution have heart disease risk 1.61 higher than private sector.

Analysis result binary logistic regression to metabolic patients show metabolic disease factor like hypertension, diabetes mellitus and stroke in table Variable in the equation indicates significant effect of wald test result \(P\) value < 0.05, pada CI 95% on heart disease. Result of Nagelkerke R Square value in table of Model Summary is 0.06 (6%), hence metabolic disease can explain its effect on heart disease of 6%. Effect of hypertensive individual to have heart disease shows Exp \((\beta) = 3.392\) and CI 95% (3.384-3.401), and risk to have heart disease is 3.92 folds higher than non hypertensive. Effect of diabetes mellitus patients on heart disease has EXP \(\beta = 3.103\) and CI of 95% (3.091-3.115), hence diabetes mellitus (DM) individuals risk 3.103 folds higher than non diabetes mellitus individuals to have heart disease. Effect of stroke individuals shows EXP \(\beta = 2.044\) and CI 95% (2.033-2.054), hence have risk to have heart disease 2.044 folds higher than non stroke individuals.

Discussion

Heart disease, in spite of its lethality and expensive, but heart disease is a type of disease that can be prevented by early detection and control of risk factors\(^6\). Heart disease control in Indonesia is conducted in comprehensive (promotion, preventive, curative and rehabilitative), efficient, effective, integrated and sustainable way\(^1\). Prevention of heart disease in the community can work well, if the community understands the guidelines for controlling heart disease well and applies them correctly\(^7\).

In addition to community characteristics such as gender, age, education and occupation, several previous studies have explained that people who live in urban areas will have a 1.35 times higher risk of heart disease than those who live in rural areas\(^{14}\). Heart disease in urban communities is triggered by a lot of pollution, stress, unhealthy behavior, as happened in Nepal, India, which triggers heart disease\(^{15}\), as well as the urban people’s diet which generally contains high fat, high protein, low carbohydrates and low fiber is also a risk trigger. heart disease\(^{16}\).

Based on age and gender, the binary logistic statistic test indicated a significant effect on heart disease. Women are easier to have heart disease than men, and the age group > 45 years old is more accessible to have heart disease than those in the lower age group\(^5\). According to age, morbidity and mortality rate due to heart disease increase, and 4 of 5 patients with heart disease aged 65 years old or more were died\(^{17}\). Overweight is found higher in those at 40 years old age group, and this is the trigger for the high cases of heart disease in that group\(^{15}\). Another factor states that heart disease is also significantly influenced by gender and duration of diabetes\(^{10}\). Heart disease is more common in women\(^5\).

The older you are, the more likely it is that rust will stick to the walls, and this is one of the early
blood flow disorders in the body that can trigger heart disease. Age 20 years old or above, both in men and women who live in American rural areas, show increased mortality due to heart disease, but the difference is found in another region (14).

Education and occupation are part of the demographic factors, which determine a person’s socioeconomic status. The higher a person’s education, the easier it will be to get a decent job and income, such as a government employee (11). The relationship between the type of work and heart disease shows that work as government employees and retired civil servants has a higher percentage of heart disease than other types of work. Higher income in urban society causes change in diet since in general they often consume fast food with high fat, high protein, low carbohydrate and low fiber. It causes urban society have obesity problem which lead to heart disease. Working with the government generally earns decent income, if life behavior is not controlled and tends to follow modern behavior such as fast food habits that are high in fat, high in protein, low in carbohydrates and low in fiber. This is one of the reasons why many well-paid employees such as government employees are obese. Obesity is a risk factor for heart disease (16).

Good public knowledge of heart disease shows a significant relationship to heart disease prevention (18). Those with low education generally work in the open and due to low knowledge, they also smoke more. Though smoking can trigger stroke and heart disease. Therefore, low education and low employment will be the dominant factors causing heart disease (19)(6). Hypertension is a disease caused by persistently increased blood pressure above the normal limit exceeding a systolic blood pressure of less than 140 mmHg and a diastolic blood pressure of less than 90 mmHg. The impact of high blood pressure continuously causes damage to the arterial vascular system and hardening occurs due to fatty deposits on the artery walls, thereby narrowing the lumen contained in blood vessels, this is what triggers heart and blood vessel disease (20).

Increased systemic blood pressure due to hypertension can increase resistance on blood pumping from left ventricle adding to heart workload (11). It is in accordance with this research result proving that hypertension has significant effect on heart disease and also in accordance with other result (6). That hypertension constitutes one dominant factor on heart disease case. The high incidence of hypertension and inadequate knowledge about diet and physical activity among urban poor community cause they risk 2-3 folds higher to have heart disease (5).

Diabetes mellitus (DM) in public is known as sweet urine and among practitioners it is known as “The Mother of Diseases”, a metabolic disease which lasts in chronic and progressive way characterized by increased blood sugar concentration which lead to more complicated and serious disease and stroke (21). If not treated well, diabetes mellitus will have serious effect to patient and his/her family like role change in family, psychological disturbance, economy problem, change in social habit, productivity and lifestyle (22).

Indonesia ranks fourth as country with most DM patients after United States, China, and India. DM in this research shows 3.1 times higher risk exposing heart disease. It is in accordance with the result of research that DM becomes one disease that can be causing factor for heart disease. DM patients who are not treated comprehensively will lead to be causing factor for heart disease (10)(23).

The metabolic disease of stroke shows as a dominant factor for heart disease. The proportion of stroke is more in those who have heart disease than those without heart disease (6). Stroke remains...
be a global health problem since it causes paralysis, permanent neurological damage, becomes a heart disease causing factor, and in some countries it ranks second as mortality cause after ischemic heart disease (24)(25).

In Indonesia, stroke case is 12.1 per 1000 (mil) and stroke case rate tend to increase along with increased age both in men and women. From South East Asian Medical Information Centre (SEAMIC) data, it is found that among ASEAN countries, Indonesia ranks highest for stroke patient rate compared with Philippines, Singapore, Brunei, Malaysia, and Thailand. (26)(27)

**Conclusion**

Heart disease constitutes non infective disease which causes highest mortality in Indonesia. Risk factors to affect heart disease is community characteristics factors (gender, education and employment) and metabolic diseases (hypertension, diabetes mellitus and stroke). Heart disease and blood vessel diseases in women are higher than in men, individuals at age $\geq 60$ years old risk higher than adult, higher education graduate risk higher than lower education graduate, government employees risk higher than non governmental employees, hypertensive individual risk than non hypertensive, individuals with diabetes mellitus risk higher than non diabetes mellitus individuals and individuals with stroke risk higher than non stroke individuals. Suggestions that can be conveyed are important for healthcare staff to socialize policy of Decree of the Minister of Health of the Republic of Indonesia, No.854/2009 about Heart and Arteries Diseases Control Guide in Indonesia so public is knowledgeable that heart disease is a preventable disease.

**Declarations**

**Ethics Approval and consent to Participate**

This Manuscript get ethics approval from National Institute of Health Research and Development, Indonesian Ministry of Health. The ethics permit number was LB.02.01/2/KE.024/2018.

**Consent for Publication**

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**Competing Interest**

We do not have any competing interests.

**Funding**

Our Institution, Indonesian Ministry of Health, did this research. There are not any funding in making this article.

**Author’s Contribution**

All the author work together. We have equal contribution. All of us are the main contributors.

**Acknowledgement**

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