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E-mail: iejsme@imu.edu.my

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Glycaemic Index – helping Malaysian consumers optimise food choice

Sangeetha Shyam^{1,2}

Malaysia's high and rising obesity and diabetes prevalence draw national concern. While improved screening in part explains this scenario, intergenerational transmission and environmental amplification are important contributors. Thus, it is with worry we reckon that Malaysia is among the few nations that showed an unhealthy trend of increasing body weight but plateauing height gains among children, over the past four decades.¹ Therefore, prevention and treatment of excessive weight gain and diabetes are of immediate and prime importance. Fortunately, obesity and diabetes have modifiable risks. In this editorial, the rationale for using the Glycaemic Index (GI) to optimise food choice for disease risk reduction and management is discussed.

Keywords: *Carbohydrates, Glycaemic Index, Malaysia, Diet*

Postprandial glycaemia as a metabolic target

Among the modifiable metabolic risks, hyperglycaemia responds well to dietary intervention, making it a suitable risk management target. Since we spend a major portion of our day in the fed state, postprandial glycaemia is of specific interest. As dietary carbohydrate appears in blood as glucose post digestion and absorption, it is the major determinant of postprandial glycaemia. Glucose in the blood is as an energy substrate for all cells and influences satiety, mood and cognitive ability. However, persistent hyperglycaemia leads to excessive body weight gain, diabetes and consequent cardiovascular risks. In those with diabetes, uncontrolled glycaemia expedites systemic complications² (Figure 1). This relationship of carbohydrates with metabolic risks is especially pronounced in Asians. Thus, it is intuitive to consider altering carbohydrate intake to alter

postprandial glycaemia for better health. So, we have two options: (i) to eliminate/restrict carbohydrate foods (ii) to improve the quality of carbohydrate foods we eat.

To lower carbohydrate intake or improve its quality?

Avoiding dietary carbohydrate was suggested since the late 1700s to treat diabetes and obesity. However, an umbrella review of systematic reviews evaluating RCTs comparing low-carbohydrate with control (low-fat/energy-restricted) diets in adults with overweight and obesity, concluded that better quality evidence is required to recommend low-carbohydrate diets over other accepted approaches.³ The current consensus is that both high and low carbohydrate diets increase mortality, with minimal risk observed when carbohydrates provide 50–55% of energy.⁴ Thus, it is no surprise that dietary guidelines around the world recommend around 55, 15 and 30% of the calories from carbohydrate, protein and fat respectively. Therefore, low carbohydrate diets (< 45 En%) are currently considered experimental, lacking in evidence for long-term safety, sustainability and affordability.

From a practical standpoint, reducing a single nutrient is challenging, especially when it involves carbohydrate, a macronutrient that contributes to 45–70% of energy in human diets. Such alterations are accompanied by compensatory increases in protein and fat and raise nutritional concerns. However, what one chooses to habitually eat is a function of taste, familiarity, accessibility and affordability. Health considerations are less powerful influencers of food choice decisions made on a day to day basis. Reducing drastically (< 45 En%) or completely cutting out carbohydrate from our diet would mean that our plate has little or no staples and probably costs more. These are “big changes” that many

¹Division of Nutrition and Dietetics, School of Health Sciences, International Medical University, Kuala Lumpur, Malaysia

²Centre for Translational Research, Institute for Research, Development and Innovation (IRDI), International Medical University, Kuala Lumpur, Malaysia

Address for Correspondence:

Dr Sangeetha Shyam, Division of Nutrition and Dietetics, School of Health Sciences, International Medical University, Malaysia

E-mail: sangeethashyam@imu.edu.my

individuals may not have the reserve and resource to make. And given the current evidence, unnecessary or dangerous to make (Figure 2: compare Panels A and B).

This leaves us to examine the second option- to improve carbohydrate quality, a reference to altering the type of carbohydrate consumed. Public health efforts to improve carbohydrate quality have been around for decades as messages to increase whole-grain and dietary fibre intakes. In the late 1970s, an increase in diabetes prevalence paralleled by technological advances in metabolic studies led to an interest in better characterising carbohydrates. It came as a surprise that carbohydrate polymer chain length did not predict their glycaemic response as expected. It was frustrating that the glycaemic response of complex carbohydrate in “potatoes” could outbeat simple carbohydrate in “soda drinks”, even when controlled for carbohydrate amount. It was exciting that al dente pasta with a similar amount of carbohydrate could lower postprandial glycaemia by around 25% compared to soda or French fries. Thus, the terms “simple” and “complex” carbohydrates, lost their lustre and a realisation dawned that not all carbohydrates are the same. Consequently, research to categorise carbohydrate foods by their glycaemic response galvanised.⁵

Glycaemic Index: A measure of carbohydrate quality

In the 1980s, GI was proposed to evaluate carbohydrate quality. GI is a numerical value that ranks carbohydrate foods from 0-100, in proportion to the postprandial glycaemic response they produce. GI of a food is determined using a standardised *in vivo* process that measures and compares the incremental area under the blood glucose response curve of a test food with a standard glucose drink. The amount of food and glucose

served to volunteers in GI testing are standardised to contain 50g available carbohydrate, accounting only for metabolisable carbohydrate. Thus, the GI value of glucose is pegged at 100. White bread, white rice and brown rice, in proportion to the glycaemic response they produce in comparison to glucose, have GI values of 83, 71 and 48 respectively.⁶ The higher the GI value of food, the more rapid and higher is the postprandial glycaemic rise it produces (Figure 3). To facilitate interpretation, foods are classified into three GI categories: high (GI >70), intermediate (GI between 55 to 70) and low (GI <55).

Foods differ in their GI owing to the type of carbohydrate they contain, the food matrix and the amount of processing it has undergone. For instance, branched-chain amylopectin starch is more susceptible to hydrolysis by amylase and has higher GI, while linear amylose is more slowly hydrolysed and has a lower GI. Thus, Basmati rice (more amylose) has a lower GI compared to Fragrant Rice (more amylopectin). Physical entrapment of starch in legumes and nuts slows its hydrolysis thereby reducing its GI. High amounts of processing such as milling, and even overcooking breaks down particle size and the ease with which enzymes can hydrolyse nutrients. This can once again increase the GI of the food. Thus, highly processed instant or overcooked oats have higher GI compared to traditional oats. Therefore, GI is both about the food and how it is cooked.

Glycaemic Index to optimise food choice for Malaysian consumers: Evidence for feasibility and utility

Since GI values are based on a food's glycaemic response, it can be used to optimise postprandial glycaemia. Replacing a similar amount of a high-GI

carbohydrate-food with a lower GI option lowers post-meal blood glucose. Let's take a cup of brown (lower GI) and white rice (higher GI) for example. They both contain practically the same amount of carbohydrate. But the lower GI of brown rice would mean that even when eating the same amount, you will experience a slower and lower rise in blood glucose versus white rice. Thus, nutritionists and dietitians help plan low-GI menus by referring to the international GI database. Recently, we have published a compendium of GI values of 940 non-Western foods including Malaysian foods.⁶ This we believe will assist healthcare professionals and Asian consumers to choose healthier carbohydrate options.

Importantly, low-GI meal plans can be aligned with nationally recommended nutrient intakes (RNI) and communicated to the public through simple strategies. GI of Malaysian diets are typically reduced by choosing wholegrains for breakfast (wholegrain bread/oats), opting for lower GI staples (replacing fragrant white rice with Basmati, brown rice, noodles or pasta), choosing one low-GI food in every meal (e.g. legumes, nuts or low-fat dairy) and avoiding highly-refined food or over-cooking. Vegetables (except for starchy vegetables like potato) and fruits minimally affect diet GI and therefore can be consumed as per the Malaysian dietary guideline of 3+2 servings per day. Recently, few Malaysian food products have listed GI values facilitating food choice. While changes in taste, affordability and familiarity are still issues one must deal with when choosing to follow a low-GI diet, the magnitude of these changes is potentially smaller and therefore easier to adopt and sustain (Figure 2: Compare Panels A and C).

From a health standpoint, high-GI diets significantly increase the risk for diabetes⁷ and adiposity-linked cancers⁸. Additionally, a low-GI diet is more effective in achieving glycaemic control in patients with type 2 diabetes.⁹ However, these findings have not been consistent, and the discrepancy is attributed to how the diet was constructed. This underlines the importance of professional guidance in creating low-GI diet plans. For Malaysian consumers, it is encouraging that local evidence exists for low-GI diet in disease risk reduction and management. In a year-long Malaysian trial that aimed to prevent cardiometabolic risks in a high risk group of women with prior gestational diabetes, small decreases in GI of healthy diets led to more women achieving and maintaining clinically significant weight loss with small added improvements in metabolic profile.¹⁰ Trial participants with impaired fasting glucose or glucose intolerance were also twice as likely to become normoglycaemic when following a low-GI diet. Among Malaysian patients with type 2 diabetes, low-GI diet significantly decreased serum fructosamine, plasma glucose and waist circumference over 12 weeks, compared to a conventional dietary prescription.¹¹ Furthermore, professionally guided low-GI education for Malaysians also improved fibre and calcium intakes. More importantly, no adverse effects of low-GI diets have been recorded. Thus low-GI diet may be well suited for Malaysian individuals with overweight, prediabetes and type 2 diabetes.

Final Thoughts

GI is a diet optimisation tool that should be used in conjunction with other dietary principles of moderation, balance and variety. GI is meant to be used only for

carbohydrate foods and it should be used to compare only foods within a group. For instance, one could compare the GI of breakfast cereals to choose a suitable option. The GI concept thus helps you optimise your diet with small swaps and while adhering to other dietary

recommendations. As with any diet, it is best practised under the guidance of a nutritionist or dietitian. And testing more Malaysian food for their GI will improve the accuracy of low-GI dietary interventions.

REFERENCES

1. Rodriguez-Martinez A, Zhou B, Sophiea MK, Bentham J, Paciorek CJ, Iurilli ML, et al. Height and body-mass index trajectories of school-aged children and adolescents from 1985 to 2019 in 200 countries and territories: a pooled analysis of 2181 population-based studies with 65 million participants. *The Lancet*. 2020; 396(10261):1511–24.
2. Pinés Corrales PJ, Bellido Castañeda V, Ampudia-Blasco FJ. Update on postprandial hyperglycemia: The pathophysiology, prevalence, consequences and implications of treating diabetes. *Rev Clínica Esp Engl Ed*. 2020; 220(1):57–68.
3. Churuanguk C, Kherouf M, Combet E, Lean M. Low-carbohydrate diets for overweight and obesity: a systematic review of the systematic reviews. *Obes Rev*. 2018; 19(12):1700–18.
4. Seidelmann SB, Claggett B, Cheng S, Henglin M, Shah A, Steffen LM, et al. Dietary carbohydrate intake and mortality: a prospective cohort study and meta-analysis. *Lancet Public Health*. 2018; 3(9):e419–28.
5. Jenkins DJ, Wolever TM, Taylor RH, Barker H, Fielden H, Baldwin JM, et al. Glycemic index of foods: a physiological basis for carbohydrate exchange. *Am J Clin Nutr*. 1981;34(3):362–6.
6. Henry CJ, Quek RYC, Kaur B, Shyam S, Singh HKG. A glycaemic index compendium of non-western foods. *Nutr Diabetes*. 2021;11(1):1–36.
7. Bhupathiraju SN, Tobias DK, Malik VS, Pan A, Hruby A, Manson JE, et al. Glycemic index, glycemic load, and risk of type 2 diabetes: results from 3 large US cohorts and an updated meta-analysis. *Am J Clin Nutr*. 2014;100(1):218–32.
8. Choi Y, Giovannucci E, Lee JE. Glycaemic index and glycaemic load in relation to risk of diabetes-related cancers: a meta-analysis. *Br J Nutr*. 2012; 108(11):1934–47.
9. Ojo O, Ojo OO, Adebawale F, Wang X-H. The Effect of Dietary Glycaemic Index on Glycaemia in Patients with Type 2 Diabetes: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. *Nutrients*. 2018;10(3):373. doi:10.3390/nu10030373
10. Sangeetha-Shyam, Fatimah A, Rohana AG, Norasyikin AW, Karuthan C, Shanita SN, et al. Lowering dietary glycaemic index through nutrition education among Malaysian women with a history of gestational diabetes mellitus. *Malays J Nutr*. 2013;19(1):9–23.
11. Yusuf BNM, Talib RA, Kamaruddin NA, Karim NA, Chinna K, Gilbertson H. A low-GI diet is associated with a short-term improvement of glycaemic control in Asian patients with type 2 diabetes. *Diabetes Obes Metab*. 2009;11(4):387–96.

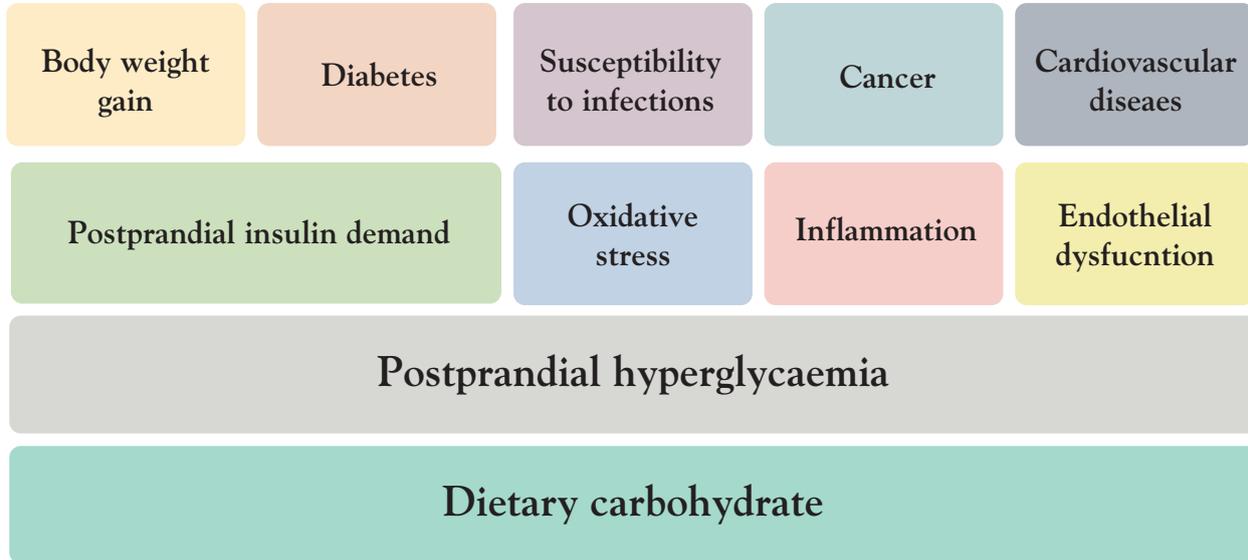


Figure 1: Consequences of postprandial hyperglycaemia

Postprandial hyperglycaemia increases risks for excessive body weight gain, diabetes, cardiovascular diseases and cancer through increases insulin demand, oxidative stress, inflammation and endothelial dysfunction. Dietary carbohydrate is the major determinant of postprandial hyperglycaemia

Panel A (Conventional healthy plate)	Vs	Panel B (Low carbohydrate plate)	Panel C Low GI plate
	Cost	\$\$\$	\$\$
	Change from usual	+++	+
	Local Evidence for Additional Health Benefits	X	✓
	Adverse health effects	!	None reported

Figure 2: Comparison of changes needed to adopt a low carbohydrate and low-GI diet from a conventional healthy diet; (Abbreviation: GI - Glycaemic Index)

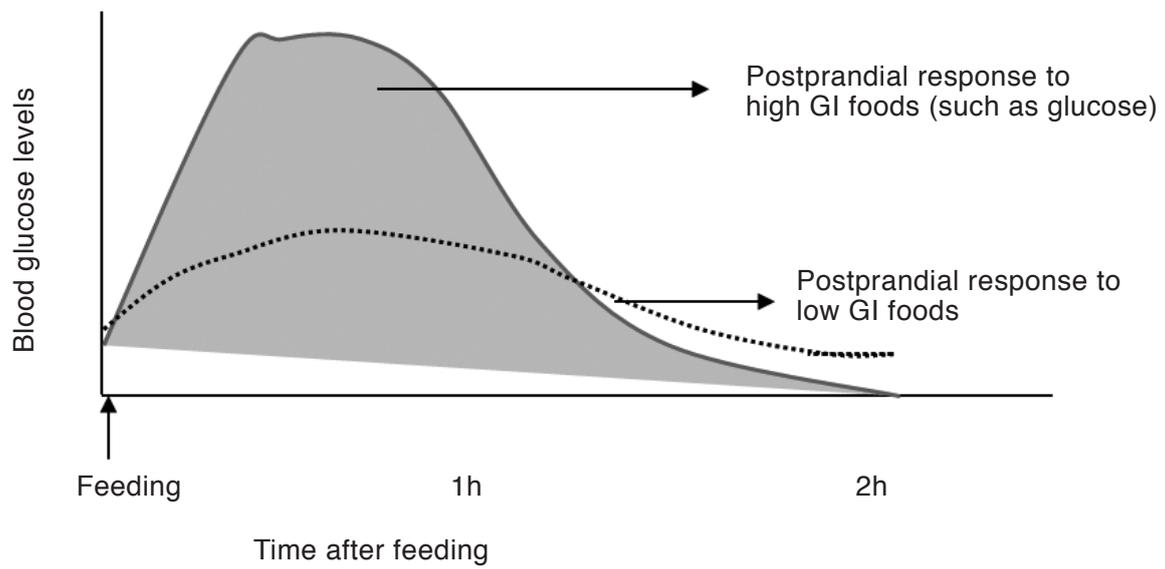


Figure 3: Comparison of postprandial blood glucose curves after consumption of low and high-GI Foods; (Abbreviation: GI - Glycaemic Index)

Knowledge and attitude towards end of life care among nursing students in a private nursing college, Penang

Swee Geok Lim, Ching Nguk Ngieng, Xie Yen Tan

ABSTRACT

Background : End of life (EOL) care is a holistic approach for patients and their families, that involves physical, emotional, spiritual, and social needs. There are approximately 80,000 Malaysians requiring EOL care annually but only 2,000 patients have access to the service. Despite an increasing demand for EOL care in Malaysia, many healthcare professionals are still unfamiliar and inadequately trained in dealing with the EOL issue. The purpose of study is to evaluate the Diploma in Nursing students' level of knowledge and attitude towards EOL care.

Method : A cross-sectional descriptive study on 127 nursing students from a private nursing college in Penang, through simple random sampling was conducted. The Palliative Care Quiz for Nursing was used to determine the knowledge of EOL care, while Frommelt Attitude Towards Care of Dying Patients-Form B, was used to measure attitude towards EOL care.

Result : Overall, the participants had poor knowledge towards EOL care with mean overall score of 8.18 ± 2.14 . The mean overall score for attitude towards EOL care was 117.76 ± 11.12 , implying a positive attitude towards EOL care. There was a significant difference in the level of knowledge ($t = 5.250, p < 0.001$) and attitude ($t = 6.184, p < 0.001$) according to the years of study.

Conclusion : The student nurses had poor level of knowledge on EOL but positive attitude towards EOL care. Adding an additional module on EOL alone is inadequate; instead emphasis on its relevancy and understanding on how it can be used to improve patient care is of far more importance.

Keywords : *end-of-life care, knowledge, attitude, terminally ill patient, nursing students*

Introduction

End of life (EOL) care is a holistic approach for patients and their families from various aspects which include physical, emotional, spiritual, and social needs (World Health Organization, 2020). It is an act of providing care to improve their quality of life until death. EOL care was first established for cancer patients, but nowadays it is also applicable for patients with life limiting diseases such as heart disease, kidney disease, liver cirrhosis, cerebrovascular disease, neurodegenerative disorder and other chronic medical illness. The population across the globe is not only ageing but also suffering from serious illnesses. Thus, it is critically important to provide patient-centered EOL care. More serious life limiting chronic conditions such as dementia, cardiovascular and respiratory diseases, and cancers are also increasing and have changed the pattern of death (Connor & Bermedo, 2014; Dulce & Cruz-Oliver, 2017). According to Ross et al. (1996), knowledge on EOL can be categorised into three subscales, namely philosophy and principles of palliative care, management of pain and symptoms, and psychosocial and spiritual care. The attitudes or feelings shown in the behaviour of nurses towards death might influence the care they provide to terminal or dying patients. Factors that determine attitudes towards death and dying, depend not only on culture, society, values orientation, and religion but also on an individual's perception and personal attitudes of death and dying (Wang et al., 2018).

Nursing Division, School of Health Sciences, International Medical University, Kuala Lumpur, Malaysia

Address for Correspondence:

Dr Swee Geok Lim, School of Health Sciences, International Medical University, No.126, Jalan Jalil Perkasa 19, Bukit Jalil, 57000 Kuala Lumpur.
Tel: 03 - 2731 7497; Email: sweegeok_lim@imu.edu.my

The growth in chronic diseases will produce an increase demand for EOL care including symptom management. Current estimates suggested that approximately 75% of people approaching the EOL may benefit from palliative care. The growing numbers of older people and increasing prevalence of chronic illness in many countries mean that more people may benefit from palliative care in the future. Healthcare systems must start to adapt to the age-related growth in deaths from chronic illness, by focusing on integration and boosting of palliative care across health and social care disciplines. Countries with similar demographic and disease changes will likely experience comparable rises in their needs. (Etkind et al., 2017). According to Hospice Malaysia (2016) there are approximately 80,000 Malaysians requiring EOL care annually but only 2,000 patients have access to the service and 90% of people in Malaysia have not heard of EOL care. According to Hardip et al. (2016), despite an increasing demand for EOL care in Malaysia, many practitioners are still unfamiliar and inadequately trained in dealing with the EOL issue. Hospice or EOL care for the terminally ill cancer patients in Malaysia are available to inpatients, unfortunately they only cover 10% of the patients in need of hospice care. This does not include patients dying of other terminal illnesses. In comparison, hospice coverage is available to 66% and 80% of terminally ill cancer patients in Singapore and New Zealand respectively.

As mentioned by the American Nurses Association Centre for Ethics and Human Rights (2016), the ability to provide the care that benefit the dying patient is the biggest challenge of EOL care in the 21st century. This will require all levels of health-care professionals, especially the nurses, who always have direct contact with patient and their family to have the knowledge

and communication skills to deliver quality EOL care. Knowledge deficit and negative attitudes concerning the EOL care are the major barriers for the current nursing to provide quality EOL care (Hussin, Wong, Chong & Subramanian, 2018).

The lack of education on EOL care has been reflected in the quality of EOL care provided to the patients by student nurses during their clinical practice (Jafari et al., 2015). Therefore, it is important to know the knowledge and attitude of student nurses on the EOL care to improve the current curriculum on the EOL care and to prepare the nursing students who are the future nurses to provide quality EOL care.

Currently in Malaysia, for the three-year Diploma in Nursing programme, nursing students are introduced to EOL in the Fundamental of Nursing module. Students are taught on how to meet the needs of the terminally ill which include care and comfort needs of the dying, bereavement process, customs and beliefs of different ethnic groups, and grieving process during their first year of nursing education. However, specific to this Nursing college, students are also required to undergo an additional compulsory module during their first year on after death. However, to date no follow up has been conducted as to how useful this module has been for the students' clinical practice. Therefore, the purpose of this study was to evaluate the Diploma in Nursing students' level of knowledge about EOL care and their attitude towards care of dying patients. Furthermore, this study will provide answers as to whether there are any significant differences between the knowledge and attitude towards EOL care according to their years of study. The null hypothesis is that there is no significant difference between the level of knowledge and attitude to their years of study.

Methods

Study design, setting and sample

This is a cross-sectional descriptive study done in a private nursing college in Penang with a total population size of 175 student nurses. Simple random sampling method, in the form of an online research randomiser tool was used to randomise the sample. Based on Raosoft sample size calculation of 5% margin error, 95% of confidence level, 50% of response distribution, and 10% of attrition rate, the minimum estimated sample size required was 133. Only second and third year Diploma in Nursing students who consented were included in this study while first year Diploma in Nursing students were excluded as they are still fresh and not fully immersed in the nursing course.

Ethical considerations

Ethical approval was obtained from the ethics committee of the International Medical University (BN 1/2020 (PR-01)). Approval for this study was also obtained from the management of the selected private hospital, and consent was obtained from the respondents prior to the conduct of the study. To ensure the anonymity and confidentiality of the respondents, the completed questionnaires were sealed in an envelope.

Measurement and instrument

A set of piloted and validated questionnaire which consisted of 3 sections was used in this study. Section A consisted of social-demographic variables which included age, ethnicity, religion, years of nursing programme, experience in caring of dying patient and whether any training or education on care of dying patient was received. The 20-item Palliative Care Quiz for Nursing, PCQN by Ross et al. (1996) was used in

Section B to assess nursing student's knowledge about EOL care. Knowledge on EOL was categorised into three subscales: (1) philosophy and principles of palliative care (4 items), (2) management of pain and symptoms (13 items) and (3) psychosocial and spiritual care (3 items). With each correct answer receiving 1 point while no point will be given for any wrong answer, the total maximum score is 20. The knowledge scores were classified into poor knowledge (< 50%), fair knowledge (50 to < 75%) and good knowledge for score of \geq 75% (Elsaman, 2017). Frommelt's Attitude Towards Care of Dying Patients-Form B, FATCOD-Form B by Frommelt (2003) was used in Section C to assess the attitude of participants towards EOL care. The tool consists of 30 items with a 5-point Likert scale, where 5 represent strongly agree, 3 represent uncertain and 1 represent strongly disagree. Scores are reversed for negative items. There are equal numbers of positively and negatively worded items used in this tool with scores ranging from 30 to 150, where 30 is a very negative attitude and 150 is a very positive attitude towards caring for the dying patients. The level of nursing students' attitude can be classified as positive attitude (\geq 75%), fair attitude (50% to <75%) and negative attitude (< 50%) (Elsaman, 2017).

Validity and reliability testing

A pilot study was carried out with Cronbach's value of \geq 0.70 as the acceptable value (Polit & Beck, 2017). The result of the pilot study showed that the Cronbach's value for PCQN and FATCOD-Form B was 0.969 and 0.983, respectively, which indicated that both instruments are reliable. Validity for both tools were reviewed by a three-member panel of experts that consists of a Nursing manager of an Intensive Care Unit, an anaesthetist and an education consultant. The

acceptable CVI (content validity index) values for three to five experts should be 1.0 (Polit & Beck, 2006; Polit, Beck, & Owen, 2007). Based on the calculation, I-CVI is 1.0 and S-CVI/UA is 1.0, hence the instrument is valid to measure the knowledge and attitude towards EOL care among nursing students.

Data collection

After obtaining approval from IMU-JC Research and Ethics committee and hospital management, a study information and questionnaire was emailed to all participants who fulfilled the inclusion criteria. Participants who consented, completed and submitted their online questionnaire. The data collection was carried out from June to August 2020.

Data analysis

Data were analysed using IBM SPSS Statistic Version 25.0. Descriptive statistics such as central tendency (mean), variation (standard deviation), percentage and frequency were used to describe the demographic data

and determine the knowledge and attitude towards EOL care among the nursing students. Inferential statistics, t-test was used to determine the difference between the level of knowledge and attitude according to their years of study with $p < 0.05$ to indicate statistical significance.

Results

Demographic data

A total number of 133 sets of questionnaires were forwarded via online where 127 participants responded (response rate was 95%). Majority of the participants were within the ages ranging from 19-24 with a mean age of 21.09 ± 1.84 (92.1%), came from Sabah and Sarawak (44.1%) and were Christians (54.3%) (Refer Table 1). Year 2 students took up 45.7% of the total respondents while the remainder, 54.3% were Year 3 students of the Diploma in Nursing programme. A total of 68.5% of them had experienced caring for dying patients while 75.6% reported that they had received some form of training on care of the dying patients.

Table 1 : Socio-demographic characteristic of participants (n = 127)

Variables	Variable categories	Frequency (n)	Percentage (%)	M±SD
Age (Years)	19-24	117	92.1	21.09±1.84
	25-30	10	7.9	
Ethnicity	Malay	15	11.8	N/A
	Chinese	37	29.1	
	Indian	19	15	
	Others	56	44.1	
Religion	Islam	15	11.8	N/A
	Buddhism	26	20.5	
	Hinduism	16	12.6	
	Christianity	69	54.3	
	Others	1	0.8	
Diploma Course Level	Year-2	58	45.7	N/A
	Year-3	69	54.3	
Experience Caring For Dying Patients	Yes	87	68.5	N/A
	No	40	31.5	
Training On Care Of Dying Patients	Yes	96	75.6	N/A
	No	31	24.4	

Table 2 showed that 31 (24.4%) student nurses scored more than 50% for subscale of philosophy and principles of palliative care, which was the highest as compared to the other two subscales, management of pain and symptoms, and psychosocial and spiritual care. The mean score for the subscale philosophy and principles of palliative care was 1.13 ± 0.78 , management of pain and

symptoms was 5.35 ± 1.79 , and psychosocial and spiritual care was 0.65 ± 0.77 . The mean overall score for PCQN was 8.18 ± 2.14 out of 20, indicating a poor level of knowledge on EOL care. A total of 72.4% of the nursing students had poor level of knowledge on EOL care (< 50%), 26% of nursing students had fair knowledge (50 to < 75%) and 1.6% had good knowledge ($\geq 75\%$).

Table 2 : Comparison of knowledge scores according to subscale of PCQN (n = 127)

Subscales of PCQN	Min to max score range (0 to 20)	M±SD	n (%) $\geq 50\%$ of total score according to subscale
Philosophy and principles of palliative care	0-4	1.13±0.78	31 (24.4)
Management of pain and symptoms	1-10	5.35±1.79	29 (22.8)
Psychosocial and spiritual care	0-3	0.65±0.77	17 (13.4)
Overall score	3-16	8.18±2.14	

Overall, no student had negative attitude towards EOL. The scores indicated that the nursing students had fair to positive attitude with scores ranging from 91-112 (n = 40, 31.5%) and 113 to 147 (n = 87, 68.5%) out of 150 as shown in Table 3. The overall mean score was 117.76 ± 11.12 with overall scores ranging from 91-147.

Table 4 showed that Year-3 nursing students (M = 9.01, SD = 2.08) scored higher on the PCQN than Year-2 nursing students (M = 7.18, SD = 1.77), indicating that the senior student nurses had better knowledge on EOL care as compared to their juniors. This difference was found to be statistically significant (p < 0.001).

Table 3 : Distribution of nursing students according to their attitudes level (n = 127)

Student nurse attitude level	Min to max score range (1 to 150)	Number of students n (%)
Negative attitude (< 50%)	0-74	0 (0)
Fair attitude (50 - < 75%)	91-112	40 (31.5)
Positive attitude (≥ 75%)	113-147	87 (68.5)
Overall score Overall M±SD	91-147 117.76±11.12	

Similarly, Year-3 nursing students scored higher on the FATCOD-Form B than Year-2 nursing students, implying that Year-3 students had more positive attitude towards EOL care (M = 122.68, SD = 10.79) as compared

to those in year two (M = 111.91, SD = 8.39). This difference was also found to be statistically significant (p < 0.001). In conclusion, the null hypothesis was rejected.

Table 4 : Difference between knowledge and attitude towards end of life care according to years of study (n = 127)

Variables	Year-2 students (n = 58) M±SD	Year-3 students (n = 69) M±SD	t-value	p-value
Knowledge	7.18±1.77	9.01±2.08	5.250	<0.001*
Attitude	111.91±8.39	122.68±10.79	6.184	<0.001*

*p < 0.001 statistically significant

Discussion

Majority of the students were between 19-24 years old which is similar to the study done in Greece (Dimoula et al., 2018), where 95.5% were also young students. This could be contributed to the minimal entry requirement of the nursing programme of the country. In this study,

more than half of the participants had experienced caring for dying patients and had received training on care of dying patients. This is in line with the study done in Indonesia (Agustini, Nursalam, Rismawan & Faridah, 2020), where 90% of their nursing students had also experienced caring for dying patients while 88.3% had

attended seminars or trainings on palliative care. This could be contributed to the similar nursing curriculum content to equip the students with basic knowledge on EOL care as part of their foundation in nursing.

Level of knowledge on EOL care among nursing students

The findings of this study showed that majority of the nursing students from this private nursing college had poor knowledge on EOL care despite having to undergo an additional compulsory module related to religion and after death. Similar findings were also reported in other countries such as Jordan, Greece, Saudi Arabia, Egypt, and Indonesia (Qadire, 2014; Elsaman, 2017; Dimoula et al., 2018; Aboshaiqah, 2020; Agustini, Nursalam, Rismawan, & Faridah, 2020). This study revealed that the knowledge on EOL care in the subscale for management of pain and symptom, and psychosocial and spiritual care was poor as compared with the philosophy and principles. This could possibly be contributed by the content of the additional compulsory module which include topics such as spiritual care in nursing, what is after death, and religion is health and healing, which focus mainly on moulding the attitude or affective domain of the nursing students. There is a lack of emphasis on pain management. The finding was supported by the study done in Greece which showed that their nursing students also had insufficient knowledge in the psychosocial and spiritual care as well as the pain and symptoms management dimension of palliative care (Dimoula et al., 2018).

Attitude towards end of life care among nursing students

In this present study, majority of the nursing students had a positive attitude. This might be due to the additional

knowledge that the nursing students were exposed to with regards to meeting the needs of terminally ill and theory on after death. In addition to that, since more than 50% of the participants experienced caring for the dying patients, either positive or negative experiences, this could be another possible factor that could have brought about a change in their attitude towards EOL care. Furthermore, the compulsory clinical attachments at the end of each semester according to the nursing curriculum in Malaysia would also be an influencing factor in building a positive or negative attitude towards EOL depending on how the clinical experiences were. Previous studies done in other countries had similar result of positive attitude towards EOL among nursing students such as Italy (115.20 ± 7.86) and Greece (111.9 ± 10.2) (Leombruni et al., 2013; Dimoula et al., 2018). These could be contributed by the years of life experiences, age and academic year as supported by the study done by Henoach et al. (2017). The final year students seemed to be more open and have positive attitude towards care of dying patient. A study done in UK, found that 91.9% out of 567 of nursing students in United Kingdom had a favourable attitude towards EOL care (Grubb & Arthur, 2016). The total mean score for attitude (FATCOD) reported by nursing students in Indonesia was 105 (SD = 7.5) with 226 (94.2%) had favourable attitude towards EOL care (Agustini, Nursalam, Rismawan & Faridah, 2020). These could be contributed to their experiences in giving care to dying patients or even family member. In contrast, another study done in Indonesia by A'la, Setioputro, and Kurniawan (2018) on 192 students who responded to the survey showed low attitude with total mean score 93.88 (SD = 5.66), scores ranging from 30-120. Lack of comprehensive curriculum about EOL care was said to contribute towards this finding (A'la, Setioputro,

& Kurniawan, 2018). Another study done by Jafari et al. (2015) in Iran showed negative to neutral attitudes towards EOL care as the item level statistics showed that the mean rating for the overall sample was 3.5 (SD = 0.43). Another previous study done by Yaqoob, Nasaif, and Kadhom (2018) in Gulf Region, included Bahrain had shown the nursing students had neutral attitude towards caring for dying patients with mean score 3.4 ± 0.3 . Scores 3.5 and above are indicative of positive and scores below 2.5 are indicative of negative attitudes. These could be contributed to lack of in-depth end of life care education in the nursing curriculum (Yaqoob, Nasaif, & Kadhom, 2018).

Differences in level of knowledge and attitude towards end of life care according to years of study

Senior students with higher education (Year three Diploma in Nursing course) had higher level of knowledge and positive attitude towards EOL care as compared to those who were in Year two. The possible reason for this might be that Year three nursing students had more exposure to caring for the dying patient during clinical practice. The final year Diploma in Nursing students are completing their training and should be work ready in both knowledge and competency to care for any patients including EOL care. The finding is similar to the studies done in Greece, United Kingdom, Turkey, Saudi Arabia, and Indonesia, where senior students had higher knowledge and attitude than juniors (Grubb & Arthur, 2016; Usta, Aygin, & Sa'lam, 2016; Ismaile, Alshehri, & Househ, 2017; Dimoula et al., 2018; A'la, Setioputro, & Kurniawan, 2018). However, in contrast with the study in Saudi Arabia, junior students had higher attitude as compared to senior nursing students (Aboshaiqah, 2020).

Recommendation

A longitudinal study involving an intervention such as providing a short-term palliative care course for three days to a week or even six weeks, and its effects should be considered for future research. Besides, future studies can also consider other influencing factors such as age, gender, experience caring for dying family members and experiences of palliative care training. A mixed methods study can also be used to provide a much more holistic understanding and obtain rich information on how nursing students perceive the importance of EOL care and how this will better prepare them upon graduation. Lastly, a review of the content of the compulsory module is recommended especially in the area of management pain and symptoms.

Limitation

One of the limitations of the study was the study population where it was confined only to student nurses from a private nursing college in Penang. Researchers would recommend conducting this study in other nursing colleges including both public and private nursing colleges or even cross the states to compare the level of knowledge and attitude towards EOL care among the nursing students.

Conclusion

The study revealed that majority of the Diploma nursing students in this study had poor level of knowledge about EOL care but there was a significant difference in their level of knowledge according to their years of study. The higher the academic level, the higher the score of knowledge they scored. The Diploma in Nursing students were perceived to have a positive attitude towards EOL care.

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REFERENCES

- Aboshaiqah, A. E. (2020). Predictors of Palliative Care Knowledge Among Nursing Students in Saudi Arabia. *Journal of Nursing Research*, 28(1), 1-9. doi: [10.1097/jnr.0000000000000301](https://doi.org/10.1097/jnr.0000000000000301)
- Agustini, N. L. P. I. B., Nursalam, N., Rismawan, M., & Faridah, V. N. (2020). Undergraduate nursing students' knowledge, attitude, and practice towards palliative care in Indonesia: A cross-sectional online survey. *International Journal of Psychosocial Rehabilitation*, 24(7), 7709-7717. doi: [10.37200/IJPR/V24I7/PR270741](https://doi.org/10.37200/IJPR/V24I7/PR270741)
- A'la, M. Z., Setioputro, B., & Kurniawan, D. E. (2018). Nursing students' attitudes towards caring for dying patients. *Nurse Media Journal of Nursing*, 8(1), 25-34. doi: [10.14710/nmjn.v8i1.17270](https://doi.org/10.14710/nmjn.v8i1.17270)
- American Nurses Association Center for Ethnic and Human Rights. (2016). Nurses' Roles and Responsibilities in Providing Care and Support at The End of Life care. Retrieved from: <https://www.nursingworld.org/~4af078/globalassets/docs/ana/ethics/endoflife-positionstatement.pdf>
- Cruz-Oliver D. M. (2017). Palliative Care: An Update. *Missouri medicine*, 114(2), 110-115.
- Dimoula, M., Kotronoulas, G., Katsaragakis, S., Christou, M., Sgourou, S., & Patiraki, E. (2018). Undergraduate nursing students' knowledge about palliative care and attitude towards end-of-life-care: A three-cohort, cross-sectional survey. *Nursing Education Today*, 74, 7-14. doi: [10.1016/j.nedt.2018.11.025](https://doi.org/10.1016/j.nedt.2018.11.025)
- Etkind, S., Bone, A., Gomes, B., Lovell, N., Evans, C., Higginson, I., & Murtagh, F. (2017). How many people will need palliative care in 2040? Past trends, future projections and implications for services. *BMC Medicine*, 15 (1). doi: [10.1186/s12916-017-0860-2](https://doi.org/10.1186/s12916-017-0860-2)
- Elsaman, S. E. (2017). Undergraduate critical care nursing students; knowledge and attitudes towards caring of dying patients. *Journal of Nursing and Health Science*, 6(1), 31-40. doi: [10.9790/1959-0601013140](https://doi.org/10.9790/1959-0601013140)
- Frommelt, K. H. (2003). Attitudes toward care of the terminally ill: An educational intervention. *The American Journal of Hospice and Palliative Care*, 20(1), 13-22. doi: [10.1177/104990910302000108](https://doi.org/10.1177/104990910302000108)
- Grubb, C., & Arthur, A. (2016). Student nurses' experience of and attitudes towards care of the dying: A cross-sectional study. *Palliative Medicine*, 30(1), 83-88. doi: [10.1177/0269216315616762](https://doi.org/10.1177/0269216315616762)
- Hardip Singh Gendeh, Avinesh Singh Bhar, Manvin Kaur Gendeh, Haayati Yaakup, Balwant Singh Gendeh, Nik Ritza Kosai & Ramzisham Bin Abdul Rahman (2017). Caring for the dying: How prepared, are we? *Medical Journal Malaysia*, 71(5), 259-263.
- Hospice Malaysia. (2016). Palliative Care Needs Assessment. Retrieved from: <https://www.hospismalaysia.org/wp-content/uploads/2016/10/Palliative-Care-Needs-Assessment-Malaysia-2016.pdf>
- Hussin, E. O. D., Wong, L. P., Chong, M. C., & Subrammanian, P. (2018). Factors associated with nurses' perceptions about quality of end of life care. *International Nursing Review*, 65(2), 200-208. doi: [10.1111/inr.12428](https://doi.org/10.1111/inr.12428)
- Iranmanesh, S., Haggstrom, T., Axelsson, K., & Savenstedt, S. (2010). Caring for dying people: Attitude among Iranian and Swedish nursing students. *Indian Journal of Palliative Care*, 16(3), 147-153. doi: [10.4103/0973-1075.73643](https://doi.org/10.4103/0973-1075.73643)
- Ismaile, S., Alshehri, H. H., & Househ, M. (2017). Knowledge of palliative care among nursing students. *Studies in Health Technology and Informatics*, 238, 261-264. doi: [10.3233/978-1-61499-781-8-261](https://doi.org/10.3233/978-1-61499-781-8-261)
- Jafari, M., Rafiei, H., Nassehi, A., Soleimani, F., Arab, M., & Noormohammadi, M. (2015). Caring for dying patients: Attitude of nursing students and effects of education. *Indian Journal of Palliative Care*, 21(2), 192-197. doi: [10.4103/0973-1075.156497](https://doi.org/10.4103/0973-1075.156497)
- Leombruni, P., Miniotti, M., Bovero, A., Zizzi, F., Castelli, L., & Torta, R. (2013). Attitudes toward caring for dying patients: An overview among Italian nursing students and preliminary psychometrics of the FATCOD-B scale. *Journal of Nursing Education and Practice*, 4(3). doi: [10.5430/jnep.v4n3p188](https://doi.org/10.5430/jnep.v4n3p188)
- Polit, D. F., & Beck, C. T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health*, 29(5), 489-497. doi: [10.1002/nur.20147](https://doi.org/10.1002/nur.20147)
- Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health*, 30(4), 459-467. doi: [10.1002/nur.20199](https://doi.org/10.1002/nur.20199)
- Polit, D. F., & Beck, C. T. (2017). *Essentials of Nursing Research: Appraising Evidence for Nursing Practice*. (9th ed.). Wolters Kluwer: Lippincott Williams & Wilkins.
- Qadire, A. M. (2014). Knowledge of palliative care: An online survey. *Nurse Education Today*, 34(5), 714-718. doi: [10.1016/j.nedt.2013.08.019](https://doi.org/10.1016/j.nedt.2013.08.019)
- Usta, E., Aygin, D., & Sa lam, E. (2016). Knowledge and opinions of nursing students on palliative care: A university example. *Journal of Human Sciences*, 13(3), 4405-4415. doi: [10.14687/jhs.v13i3.3917](https://doi.org/10.14687/jhs.v13i3.3917)
- Wang, L., Li, C., Zhang, Q. & Li, Y. (2018). Clinical nurses' attitudes towards death and caring for dying patients in China. *International Journal of Palliative Nursing*, 24(1), 33-39. <https://doi.org/10.12968/ijpn.2018.24.1.33>.
- World Health Organization. (2020). WHO Definition of Palliative. Retrieved from: <https://www.who.int/cancer/palliative/definition/en/>
- Yaqoob, M., Nassaiif, H., & Kadhom, H. (2018). Undergraduate final year nursing students' attitudes toward caring for dying patients: Bahrain's experience. *Clinical Nursing Studies*, 6(4), 53-58. doi: doi.org/10.5430/cns.v6n4p53

Predictive parameters of potential COVID-19 without epidemiological clues and management strategy in resources limited setting

Kok Wei Poh¹, Pei Wen Tan², Ji Yin Wong², Cheng Huong Ngan², Yin Jie Ng², Raymund Dass², Tiang Koi Ng²

ABSTRACT

Background

Managing potential COVID-19 patients is challenging when resources were limited. The objective of this study was to evaluate the predictive parameters and management strategy for potential COVID-19 cases who are without contact or travelling history.

Methods

Retrospective study of potential COVID-19 patients without direct contact or travelling history, admitted to Hospital Tuanku Ja'afar Seremban. Patients were risk-stratified to either low or medium risk and admitted to designated wards, respectively. They were categorised to severe acute respiratory infection (SARI); influenza-like illness (ILI); dengue fever or viral fever like (DVF); or none. Clinical, laboratory and radiological variables were evaluated for predictive value. Positive cases were isolated to negative pressure isolation rooms and the neighbouring patients underwent surveillance.

Results

812 patients were studied, with 478 fulfilled SARI, ILI, and DVF. 18 (2.2%) of them were COVID-19 positive, and all patients in "none" group were negative. Hypoxia without dyspnoea and medium risk criteria were significant in predicting COVID-19 with $p < 0.01$ (OR 7.18; 95% CI 2.70, 19.13) and $p < 0.01$ (OR 35.77; 95% CI 11.25, 113.71) respectively. Absolute lymphocyte count showed no predictive value ($P = 0.88$ 95% CI -0.78, 0.90). Absolute neutrophil count $\geq 10 \times 10^9/L$ cells (OR 0.11; 95% CI 0.01, 0.87) helped to exclude COVID-19. Chest radiograph of 16 (88.9%) COVID-19 patients showed heterogeneous Ill-defined opacities. No nosocomial transmission occurred during this study period.

Conclusion / Implication

Initial attention to predictive parameter, risk-stratification, clinical grouping strategy, and proper ward management helps in containment of COVID-19 and resources management without risk of nosocomial transmission.

Keywords: COVID-19; predictive parameters; resources; risk-stratification; SARS-CoV-2

Introduction

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) which is responsible for the Coronavirus disease 2019 (COVID-19) has become a global crisis.¹ It was first reported in December 2019 as a cause of a cluster of pneumonia cases in Wuhan, a city in the Hubei province of China.² SARS-CoV-2 was suggested to be zoonotic in origin due to the large number of infected individuals who have been exposed to the wet market in Wuhan City, and subsequently further spread by human-to-human transmission.³⁻⁵

Although rigorous surveillance, early detection, isolation, and quarantine are crucial in preventing sustained transmission of COVID-19^{6,7} challenges remain. Such rigorous surveillance requires adequate resources (for e.g. testing kits, and swab) along with adequate staff to perform. Thus, without the availability of these resources, patients may still present to healthcare services with either pneumonia or influenza-like illness (ILI).⁸ Therefore, it is essential for the frontline doctors to be able to diagnose potential COVID-19 cases and isolate them early while awaiting the SARS-CoV-2 result; in order to contain an outbreak and to prevent nosocomial transmission.⁹ There is without doubt that close contact with positive cases of COVID-19 requires active surveillance but there may be a significant portion

¹ Internal Medicine, IMU Clinical School, International Medical University, Jalan Dr Muthu, Bukit Rasah, 70300 Seremban, Negeri Sembilan, Malaysia.

² Medical Department, Hospital Tuanku Ja'afar Seremban, Jalan Rasah, Bukit Rasah, 70300 Seremban, Negeri Sembilan, Malaysia.

Address for Correspondence:

Dr Poh Kok Wei, Internal Medicine, IMU Clinical School, International Medical University, Jalan Dr Muthu, Bukit Rasah, 70300 Seremban, Negeri Sembilan, Malaysia. Tel: +60123305811 E-mail: kokweipoh@imu.edu.my

of patients that did not have such history of close contact and was later missed in the surveillance.^{10,11} This poses a significant challenge to the frontline doctors whether to screen for COVID-19, when simultaneously there is a need for a balance between resource utilisation and case detection to avoid either an overuse of resources or an under-detection of COVID-19.¹² Furthermore, the number of suspected cases may exceed the capacity of negative pressure rooms available and thus, ward management strategy is essential in preventing nosocomial transmission.

We overcame these challenges by having a new broader screening criterion, risk-stratification of potential COVID-19 patients with clinical grouping strategy, initial admission to designated wards, and a set criterion for stepping down care to the general ward. The aim of this study was to identify the predictive parameters in diagnosing or excluding COVID-19 in patients without contact or travelling history, and to assess the effectiveness of risk-stratification and clinical grouping. Secondary objective was to assess the risk of nosocomial transmission in open general ward by maintaining social distancing and avoidance of aerosol generating procedure.

Methods

Study design

This was a retrospective study of patients admitted from 19th March 2020 to 1st May 2020 in Hospital Tuanku Ja'afar Seremban, a tertiary referral hospital for Negeri Sembilan in Malaysia. Suspected cases of COVID-19 who did not have close contact (less than 1 meter for more than 15 minutes) with confirmed cases of COVID-19 or travelling history from overseas were included into this study. Patients less than 12 years old were excluded from this study. Patients with close

contact or travelling history to overseas were admitted to negative pressure rooms and excluded from this study as well.

Definition

- a. A suspected case of COVID-19 referred to a patient who met the case-selection criteria.
- b. In our study context, SARI was defined by the presence of respiratory signs and symptoms (e.g. cough, dyspnoea, wheezing and/or crepitation on auscultation) that suggest lower respiratory tract infection with or without fever. Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) and acute exacerbation of bronchial asthma (AEBA), that were both infective and not infective in origin were included into this clinical group as well.
- c. ILI was defined by clinical syndrome of upper respiratory tract infection (URTI) with or without fever. This requires at least 2 of the following:
 - i. Fever
 - ii. Cough
 - iii. Runny nose
 - iv. Sore throat
- d. Dengue fever or viral fever like illness (DVF) was defined as clinical syndrome that suggests dengue fever or viral fever (e.g. fever, arthralgia, myalgia, vomiting and/or diarrhoea) without the presence of signs and symptoms of URTI (such as cough, sore throat, and/or runny nose).
- e. Preceding URTI was defined by having symptoms of URTI within 1 week of presentation but was admitted for other illnesses.
- f. Fever was defined as a temperature of 37.8°C or more.

- g. Hypoxia was defined by oxygen saturation by pulse oximetry (SpO_2) $<95\%$ or arterial partial pressure oxygen (PaO_2) under room air of $<80\text{mmHg}$, or PaO_2/FiO_2 ratio of < 380 . SpO_2 reading was favoured as a marker of hypoxia before PaO_2 and then followed by PaO_2/FiO_2 ratio.
- h. Covid-19 detection was by oropharyngeal and nasopharyngeal swab or endotracheal tube aspiration if intubated. Samples were sent for reverse transcription polymerase chain reaction to detect SARS-CoV-2 RNA (RT-PCR SARS-CoV-2 RNA).

Standard of Care

Suspected cases were admitted to 2 designated wards (1 ward for low risk and 1 for medium risk). A “low” risk ward was an open general ward with 30 beds. A “medium” risk ward has 7 two-bedded and 2 single-bedded non-negative pressure rooms. In both wards, patients’ beds and belongings were kept at least 1 meter apart. All patients were required to wear masks at all times if possible. Aerosol generating procedures such as nebulisation and non-invasive ventilation were discouraged in these wards. Nebulisation was replaced by spacer or aerochamber. If nebulisation is deemed necessary, patients were transferred to a negative pressure room. Patients who later had positive COVID-19 result were transferred to a negative pressure isolation room, and the neighbouring patients were put under surveillance with repeated oropharyngeal and nasopharyngeal swab for RT-PCR SARS-CoV-2 RNA on days 6-7 and symptoms were checked on day 14 from last contact.

Patients within the “SARI” and “ILI” groups were either discharged or stepped down to the general ward when they tested negative for COVID-19 and clinically improved. A second test for RT-PCR SARS-CoV-2

RNA was performed when there was no improvement after 48 hours. Patients within DVF or “none” categories were either discharged or stepped down to the general ward after the first negative test for COVID-19.

Risk stratification

Patients with a history of social gathering within 2 weeks of symptoms developed, direct contact with potential COVID-19 individuals but awaiting or unknown result, initial presentation suggestive of viral pneumonia, a healthcare worker or living with a healthcare worker, or peers who had symptoms of respiratory infection, were categorised into “medium” risk group. Absence of these mentioned risks were categorised into the “low” risk group.

New case selection criteria and clinical grouping

Previous case selection criteria which only included SARI and ILI have been revised. New case selection criteria for COVID-19 and clinical grouping included: (1) SARI, which consists of all pneumonia, and AECOPD or AEBA that is not due to pneumonia but requires admission; (2) ILI; (3) DVF; and (4) None. The “None” clinical group consisted of: (1) patient admitted for other reason but had either sore throat, cough or runny nose; (2) chest radiograph with suspected consolidation but absent of sign and symptoms of pneumonia; and (3) non-respiratory presentation but had medium risk criteria.

Statistical analysis

Univariate logistic regression, binary logistic regression and Chi-Square test were used to determine the associations of the measured variables with the outcome variable, SARS-CoV-2 RNA result (positive or negative). Student’s t-test was used to compare means. $P<0.05$ was considered as statistically significant.

Variables associated with significant predictive values (positive or negative) of SARS-CoV-2 RNA ($P < 0.05$) were included in the multivariable logistic regression model. However, the chest radiograph was excluded from the multivariable logistic regression model because it may not be readily available in the screening process of COVID-19. Variables measured include the presence of fever, hypoxia, hypoxia without dyspnoea, total white blood cell count (WBC), absolute neutrophil count (ANC), absolute lymphocyte count (ALC), chest radiograph characteristic and risk. All variables studied were the initial parameters upon admission.

Results

A total of 812 patients were included in this study, of which 337 patients fulfilled SARI, 78 ILI and 63 DVF. 334 of them did not fulfil any of these clinical groups. 15 out of 337 (4.5%) SARI, 2 out of 78 (2.6%) ILI, and 1 out of 63 (1.6%) DVF were tested positive for COVID-19. No cases from the "none" group were tested positive for COVID-19 (Table 1). Clinical background characteristics of patients within these clinical groups (SARI, ILI, DVF) are shown in Table 2. Only 27.8% of patients with COVID-19 upon admission experienced dyspnoea and 44.4% were hypoxic without dyspnoea.

There was a significant difference when comparing mean values of WCC ($P = 0.01$ 95% CI 0.79, 4.21) and ANC ($P = 0.02$ 95% CI 0.28, 3.24) between COVID-19 detected and undetected patients. Conversely, comparing mean values of ALC was not significant ($P = 0.88$ 95% CI -0.78, 0.90). Among the total of 63 patients categorised into DVF, 8 had negative dengue serology results and only 1 of them tested positive for COVID-19 (detailed results are provided in Supplementary Appendix in Table S1).

Among the chest radiograph findings, heterogeneous ill-defined opacities was the most common (84.2%) radiological finding in COVID-19 positive patients followed by normal chest radiological finding (0.8%). Lobar consolidation, pleural effusion, reticular opacities, and fluid overload features did not yield any positive COVID-19 cases (Table 2) (Figure 1).

Presence of fever, hypoxia, preceding URTI, cough, dyspnoea, WCC, ANC, and ALC did not yield a significant predictive parameter in the univariate logistic regression analysis. However, presence of medium risk factor and hypoxic without dyspnoea were both significant; $p < 0.01$ (OR 35.77; 95% CI 11.25, 113.71) and $p < 0.01$ (OR 7.18; 95% CI 2.70, 19.13) respectively (Table S2).

Multivariate logistic regression analysis (Table 3) showed a significant predictive value with the presence of hypoxia without dyspnoea (OR 9.27; 95% CI 3.24, 26.56) and $ANC \geq 10 \times 10^9/L$ cells (OR 0.11; 95% CI 0.01, 0.87) when assuming the risk factor was unknown. WBC, ALC, and ANC were excluded from such analysis in view of its close similarities with the parameter $ANC \geq 10 \times 10^9/L$ cells cut off value.

During this study period, there was an accumulative number of 15 neighbouring patients that underwent surveillance (Table S3). All were negative of COVID-19 and absence of COVID-19 related symptoms. There was also an accumulative number of 6 staff members who developed mild URTI symptoms and tested negative for COVID-19.

Discussion

Risk stratification, and selection criteria for screening is a crucial part of COVID-19 outbreak containment strategy. A carefully designed strategy in targeting

case selection and isolation is not only able to capture suspected cases of COVID-19, prevent nosocomial transmission but also reduces unnecessary wastage of resources.¹³ Although COVID-19 predominantly presented with respiratory symptoms with a wide range of severity^{8,14-16}, atypical presentation such as predominant gastrointestinal symptoms has been reported.^{17,18} There were also concerns regarding COVID-19 mimicking as dengue fever.^{19,20} Putting all these factors into consideration, we decided on having a relatively lower threshold for case selection, and introduced DVF as a new clinical group for surveillance. We were able to capture 1 positive COVID-19 case who presented like dengue fever, but dengue serology was negative. We recommend DVF to be incorporated in future policy as screening criteria.

All positive cases were either within the SARI, ILI or DVF clinical groups. Those that did not fulfil these criteria were all negative of COVID-19. We felt that examining between clinical groups would be more relevant as individual symptoms would have a wide range of overlap with many other diseases. Most literature available during this study period was focusing mainly on individual symptoms rather than clinical syndrome.^{8,14,16,21} To our best knowledge, we have not identified any study done on clinical groups yet.

ILI was defined by the World Health Organization (WHO) as fever of $\geq 38^{\circ}\text{C}$ and cough, with onset within the last 10 days; and SARI defined as history of a fever or measured fever of $\geq 38^{\circ}\text{C}$; and cough, with onset within the last 10 days and requires hospitalisation.^{22,23} However, a study by Guan et al. on the clinical characteristics of COVID-19 in China showed that only 43.8% had fever upon admission.⁸ Similar findings were reproduced in our study which showed that only 50% of COVID-19 patients had fever upon presentation. Hence, we revised

our SARI definition from the beginning to include those without fever in order to prevent missing this group of patients.

Lymphopenia has been associated with severity of COVID-19.^{24,25} It was even used as a clue to aid in the diagnosis of COVID-19.²⁴ It is important to know that different literature had slightly different definitions of lymphopenia (median ALC ranging somewhere between 0.8 to 1.1) and there was a significant portion of positive cases that do not have lymphopenia.^{8,16,25,26} In this study, the median ALC among positive cases were relatively higher at 1.6. This may be a result of a small sample size among the positive cases. A study by Zhu et al. on the initial clinical features of suspected COVID-19 found that 29% of negative cases had lymphopenia (<1.1) and ALC was relatively higher among the negative cases.²⁷ However, no statistical analysis was performed, and thus we are unable to draw any significant comparison. We did not find ALC to be helpful in suspecting COVID-19 from this study. This finding was in concordance with a study by Zhao et al., where ALC showed no significant difference between COVID-19 and non-COVID-19 pneumonia.²⁸

ANC has been attempted in several studies to differentiate between viral and bacterial pneumonia.²⁹⁻³¹ A similar attempt was conducted during the SARS outbreak, where higher ANC made the diagnosis of SARS less likely.^{32,33} In our study, a higher ANC at a cut-off point of $10 \times 10^9/\text{L}$ cells helped to exclude COVID-19. Nonetheless, $\text{ANC} < 10$ does not make the diagnosis of COVID-19 likely. The median ANC among COVID-19 in this study was 5.1, which was compatible with the study in New York by Richardson et al., that showed a median of 5.3.²⁶ Up to this date, we were only able to identify 1 study comparing suspected COVID-19 with confirmed COVID-19 cases. This study by Zhu et al.,

the ANC were lower in confirmed cases, although no statistical analysis was performed.²⁷

It is worth noticing that less than half COVID-19 patients experienced shortness of breath including severe illness, even though the majority had abnormalities either in chest radiograph or computerised tomography (CT) scan.^{8,16,34,35} A study by Yang et al. showed that only 1.34% had dyspnoea despite 9.4% having decreased oxygen saturation.³⁶ In our study, hypoxia without dyspnoea occurs more often in COVID-19 patients and appears to be a good predictor for suspecting COVID-19 even when considering all other factors.

There was no unifying terminology across current literature used to describe plain radiographs of COVID-19 with pneumonia; from ground glass opacities, ill-defined opacities, patchy shadowing, to bilateral consolidation.^{8,37-39} Although chest radiograph is less sensitive than CT scan in diagnosing COVID-19 pneumonia, it remains an important tool as it has a certain degree of correlation with CT scan.³⁷ Moreover, it is generally not recommended for CT scan as a routine for COVID-19.⁴⁰ We found chest radiographs to be very helpful in diagnosing COVID-19 pneumonia while awaiting RT-PCR SARS-CoV-2 RNA test results.

There were a few limitations in our study. The sample size for positive cases was relatively small. This may be the result of the extensive contact tracing and surveillance done by our public health sector. Secondly, we may not have captured patients with very mild symptoms that have not presented to us but subsequently recovered. This group of patients may represent a significant portion of information that we are missing out. However, as the focus of this study was towards risk-stratification and suspecting COVID-19 when presented to healthcare facilities, the overall effect on decision making would not be altered.

It is important to realise that our strategy is not a replacement for contact tracing and rigorous surveillance. Symptoms-based screening would fail to capture many patients with COVID-19 because of asymptomatic carrier.⁴¹⁻⁴⁴ However, balancing between case selection and resources are crucial in policy and clinical decision. With the presence of an effective contact tracing and surveillance, more attention could be paid towards SARI, ILI, DVF, those with medium risk criteria, presence of hypoxia without dyspnoea, and suggestive chest radiograph as prioritised surveillance criteria in hospital. This would also help in resources distribution such as negative pressure isolation room prioritisation. Furthermore, allocation of patients in open general ward is a good alternative as shown in our study where no nosocomial transmission was reported when social distancing was kept and avoiding aerosol generating procedures.

In conclusion, initial risk-stratification, the presence of hypoxia without dyspnoea, and suggestive chest radiograph finding help in identifying COVID-19. Conversely, high ANC made the diagnosis of COVID-19 less likely. ALC was not helpful in suspecting COVID-19. Initial attention to predictive parameter, risk-stratification, clinical grouping strategy, and proper ward management helps in containment of COVID-19 and resources management without risk of nosocomial transmission. We recommend DVF as a new clinical group to be screened for COVID-19. A further study is required to assess incorporating predictive parameters into the decision-making algorithm.

Ethical Approval

This study was conducted in compliance with ethical principles outlined in the Declaration of Helsinki. This study was reviewed and approved by Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia.

Conflict of interest

The authors of this study declare that they each have no conflict of interest.

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REFERENCES

1. WHO. Coronavirus disease. World Heal Organ 2020;2019(March):2633. Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019>
2. Zhu N, Zhang D, Wang W, et al. A Novel Coronavirus from Patients with Pneumonia in China, 2019. *N Engl J Med* 2020;382(8):727–33. Available from: <http://www.nejm.org/doi/10.1056/NEJMoa2001017>
3. Rothan HA, Byrareddy SN. The epidemiology and pathogenesis of coronavirus disease (COVID-19) outbreak. *J Autoimmun* 2020;109(February):102433. Available from: <https://doi.org/10.1016/j.jaut.2020.102433>
4. Wu P, Hao X, Lau EHY, et al. Real-time tentative assessment of the epidemiological characteristics of novel coronavirus infections in Wuhan, China, as at 22 January 2020. *Eurosurveillance* 2020;25(3):1–6.
5. Kucharski AJ, Russell TW, Diamond C, et al. Early dynamics of transmission and control of COVID-19: a mathematical modelling study. *Lancet Infect Dis* 2020;20(5):553–8.
6. Thompson RN. Novel Coronavirus Outbreak in Wuhan, China, 2020: Intense Surveillance Is Vital for Preventing Sustained Transmission in New Locations. *J Clin Med* 2020;9(2):498.
7. Lai CC, Shih TP, Ko WC, Tang HJ, Hsueh PR. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and coronavirus disease-2019 (COVID-19): The epidemic and the challenges. *Int J Antimicrob Agents* 2020;55(3):105924. Available from: <https://doi.org/10.1016/j.ijantimicag.2020.105924>
8. Guan WJ, Ni ZY, Hu Y, et al. Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med* 2020;382(18):1708–20. Available from: [doi:10.1056/NEJMoa2002032](https://doi.org/10.1056/NEJMoa2002032)
9. Klompas M. Coronavirus Disease 2019 (COVID-19): Protecting Hospitals From the Invisible. *Ann Intern Med* 2020;172(9):619–20. Available from: <http://www.embase.com/search/results?subaction=viewrecord&from=export&id=L631241038%0Ahttp://dx.doi.org/10.7326/M20-0751>
10. Ng Y, Li Z, Chua YX, et al. Evaluation of the effectiveness of surveillance and containment measures for the first 100 patients with COVID-19 in Singapore - January 2-February 29, 2020. *Morb Mortal Wkly Rep* 2020;69(11):307–11.
11. Wu Z, McGoogan JM. Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China. *JAMA* 2020;323(13):1239. Available from: <https://jamanetwork.com/journals/jama/fullarticle/2762130>
12. Emanuel EJ, Persad G, Upshur R, et al. Fair Allocation of Scarce Medical Resources in the Time of Covid-19. *N Engl J Med* 2020;382(21):2049–55. Available from: <http://www.nejm.org/doi/10.1056/NEJMs2005114>
13. Wee LE, Fua T, Chua YY, et al. Containing COVID 19 in the Emergency Department: The Role of Improved Case Detection and Segregation of Suspect Cases. *Acad Emerg Med* 2020;27(5):379–87. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/acem.13984>

14. Goyal P, Choi J, Pinheiro LC, et al. Clinical Characteristics of Covid-19 in New York City. *N Engl J Med* 2020;375(13):NEJMc2010419. Available from: <http://www.nejm.org/doi/10.1056/NEJMc2010419>
15. Rodriguez-Morales AJ, Cardona-Ospina JA, Gutiérrez-Ocampo E, et al. Clinical, laboratory and imaging features of COVID-19: A systematic review and meta-analysis. *Travel Med Infect Dis* 2020;34(February):101623. Available from: <https://doi.org/10.1016/j.tmaid.2020.101623>
16. Tian S, Hu N, Lou J, et al. Characteristics of COVID-19 infection in Beijing. *J Infect* 2020;80(4):401–6. Available from: <https://doi.org/10.1016/j.jinf.2020.02.018>
17. Pan L, Mu M, Yang P, et al. Clinical Characteristics of COVID-19 Patients With Digestive Symptoms in Hubei, China. *Am J Gastroenterol* 2020;115(5):766–73. Available from: <http://journals.lww.com/10.14309/ajg.0000000000000620>
18. Jin X, Lian J-S, Hu J-H, et al. Epidemiological, clinical and virological characteristics of 74 cases of coronavirus-infected disease 2019 (COVID-19) with gastrointestinal symptoms. *Gut* 2020;69(6):1002–9. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1477893920301277>
19. Lorenz C, Azevedo TS, Chiaravalloti-Neto F. COVID-19 and dengue fever: A dangerous combination for the health system in Brazil. *Travel Med Infect Dis* 2020;(January):101659. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1477893920301277>
20. Yan G, Lee CK, Lam LTM, et al. Covert COVID-19 and false-positive dengue serology in Singapore. *Lancet Infect Dis* 2020;20(5):536. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S1473309920301584>
21. Lei S, Jiang F, Su W, et al. Clinical characteristics and outcomes of patients undergoing surgeries during the incubation period of COVID-19 infection. *EClinicalMedicine* 2020;21:100331. Available from: <https://doi.org/10.1016/j.eclinm.2020.100331>
22. WHO | WHO surveillance case definitions for ILI and SARI [Internet]. [cited 2020 May 20]; Available from: https://www.who.int/influenza/surveillance_monitoring/ili_sari_surveillance_case_definition/en/
23. WHO. Global Surveillance for human infection with coronavirus disease (COVID-19). *Interim Guid* 2020;(February):27–9. Available from: [https://www.who.int/publications-detail/global-surveillance-for-human-infection-with-novel-coronavirus-\(2019-ncov\)](https://www.who.int/publications-detail/global-surveillance-for-human-infection-with-novel-coronavirus-(2019-ncov))
24. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet* 2020;395(10229):1054–62. Available from: [http://dx.doi.org/10.1016/S0140-6736\(20\)30566-3](http://dx.doi.org/10.1016/S0140-6736(20)30566-3)
25. Tan L, Wang Q, Zhang D, et al. Lymphopenia predicts disease severity of COVID-19: a descriptive and predictive study. *Signal Transduct Target Ther* 2020;5(1):16–8.
26. Richardson S, Hirsch JS, Narasimhan M, et al. Presenting Characteristics, Comorbidities, and Outcomes Among 5700 Patients Hospitalized With COVID-19 in the New York City Area. *JAMA* 2020;10022:1–8. Available from: <https://jamanetwork.com/journals/jama/fullarticle/2765184>
27. Zhu W, Xie K, Lu H, Xu L, Zhou S, Fang S. Initial clinical features of suspected Coronavirus Disease 2019 in two emergency departments outside of Hubei, China. *J Med Virol* 2020;24(March):jmv.25763. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/jmv.25763>
28. Zhao D, Yao F, Wang L, et al. A Comparative Study on the Clinical Features of Coronavirus 2019 (COVID-19) Pneumonia With Other Pneumonias. *Clin Infect Dis* 2020;2019(Xx Xxxx):1–6. Available from: <https://academic.oup.com/cid/advance-article/doi/10.1093/cid/ciaa247/5803302>
29. Korppi M, Heiskanen-Kosma T, Leinonen M. White blood cells, C-reactive protein and erythrocyte sedimentation rate in pneumococcal pneumonia in children. *Eur Respir J* 1997;10(5):1125–9.
30. Bhuiyan MU, Blyth CC, West R, et al. Combination of clinical symptoms and blood biomarkers can improve discrimination between bacterial or viral community-acquired pneumonia in children. *BMC Pulm Med* 2019;19(1):71. Available from: <https://bmcpulmed.biomedcentral.com/articles/10.1186/s12890-019-0835-5>
31. Lee N, Rainer TH, Ip M, et al. Role of laboratory variables in differentiating SARS-coronavirus from other causes of community-acquired pneumonia within the first 72 h of hospitalization. *Eur J Clin Microbiol Infect Dis* 2006;25(12):765–72.
32. Rainer TH, Lee N, Ip M, et al. Features discriminating SARS from other severe viral respiratory tract infections. *Eur J Clin Microbiol Infect Dis* 2007;26(2):121–9.
33. Muller MP, Richardson SE, McGeer A, et al. Early diagnosis of SARS: Lessons from the Toronto SARS outbreak. *Eur J Clin Microbiol Infect Dis* 2006;25(4):230–7.
34. Liu K, Fang Y-Y, Deng Y, et al. Clinical characteristics of novel coronavirus cases in tertiary hospitals in Hubei Province. *Chin Med J (Engl)* 2020;133(9):1025–31. Available from: <http://journals.lww.com/10.1097/CM9.0000000000000744>
35. Chen N, Zhou M, Dong X, et al. Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study. *Lancet* 2020;395(10223):507–13. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0140673620302117>
36. Yang W, Cao Q, Qin L, et al. Clinical characteristics and imaging manifestations of the 2019 novel coronavirus disease (COVID-19): A multi-center study in Wenzhou city, Zhejiang, China. *J Infect* 2020;80(4):388–93. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0163445320300992>
37. Wong HYF, Lam HYS, Fong AH-T, et al. Frequency and Distribution of Chest Radiographic Findings in COVID-19 Positive Patients. *Radiology* 2019;201160. Available from: <http://pubs.rsna.org/doi/10.1148/radiol.2020201160>

38. Zhang J, Dong X, Cao Y, et al. Clinical characteristics of 140 patients infected with SARS CoV 2 in Wuhan, China. *Allergy* 2020;(February):all.14238. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/all.14238>

39. Jacobi A, Chung M, Bernheim A, Eber C. Portable chest X-ray in coronavirus disease-19 (COVID-19): A pictorial review. *Clin Imaging* 2020;64(January):35–42. Available from: <https://linkinghub.elsevier.com/retrieve/pii/S0899707120301017>

40. Simpson S, Kay FU, Abbara S, et al. Radiological Society of North America Expert Consensus Statement on Reporting Chest CT Findings Related to COVID-19. Endorsed by the Society of Thoracic Radiology, the American College of Radiology, and RSNA. *J Thorac Imaging* 2020;00(00):1. Available from: <http://journals.lww.com/10.1097/RTI.0000000000000524>

41. Gandhi M, Yokoe DS, Havlir D V. Asymptomatic Transmission, the Achilles' Heel of Current Strategies to Control Covid-19. *N Engl J Med* 2020;382(22):2158–60. Available from: <http://www.nejm.org/doi/10.1056/NEJMe2009758>

42. Day M. Covid-19: identifying and isolating asymptomatic people helped eliminate virus in Italian village. *BMJ* 2020;368(March):m1165. Available from: <http://dx.doi.org/doi:10.1136/bmj.m1165>

43. Hu Z, Song C, Xu C, et al. Clinical characteristics of 24 asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China. *Sci China Life Sci* 2020;63(5):706–11.

44. Bai Y, Yao L, Wei T, et al. Presumed Asymptomatic Carrier Transmission of COVID-19. *JAMA* 2020;323(14):1406. Available from: <https://jamanetwork.com/journals/jama/fullarticle/2762028>

Table 1: Clinical groups and COVID-19 detection rates*

			Clinical Group				
			SARI	ILI	DVF	None	Total
COVID-19	not detected	Frequency, n	322	76	62	334	794
	detected	Frequency, n	15	2	1	0	18
		(%) within Clinical Group	4.5	2.6	1.6	0.0	2.2
Total			337	78	63	334	812

*SARI denotes severe acute respiratory illness, ILI influenza like illness, and DVF dengue fever or viral fever like illness.

Table 2: Clinical background characteristics of SARI, ILI and DVF*

Characteristic or Condition	COVID-19 Not Detected n=460	COVID-19 Detected n=18	P Value
Mean age, years	53 ± 20.5	56 ± 10.5	N/A
Gender, n (%)			
Male	257 (55.9)	11 (61.1)	N/A
Female	203 (44.1)	7 (38.9)	N/A
Coexisting condition, n (%)			
Bronchial Asthma	79 (17.2)	1 (5.6)	N/A
COPD	50 (10.9)	0 (0)	N/A
Diabetes Mellitus	134 (29.1)	9 (50)	N/A
Hypertension	194 (42.2)	13 (72.2)	N/A
Ischemic Heart Disease	44 (9.6)	3 (16.7)	N/A
Heart Failure	24 (5.2)	0 (0)	N/A
CKD/ESRD	32 (7)	3 (16.7)	N/A
Clinical Characteristic, n (%)			
Medium Risk	41 (8.9)	14 (77.8)	<0.01†
Fever	149 (32.9)	9 (50)	0.13†
Cough	289 (62.8)	13 (72.2)	0.42†
Dyspnoea	213 (47.4) §	5 (27.8)	0.10†
Hypoxia	164 (35.9)	10 (55.5)	0.09†
Hypoxia without dyspnoea	45 (10.0) §	8 (44.4)	<0.01†

(cont'd) Table 2: Clinical background characteristics of SARI, ILI and DVF*

WBC ($\times 10^9/L$ cells)			
Median (IQR)	9.4 (6.5-13.2)	7.7 (5.9-10.3)	N/A
Mean \pm SD	10.5 \pm 6.9	8.0 \pm 3.2	0.01‡ (95% CI 0.79, 4.21)
ANC ($\times 10^9/L$ cells)			
Median (IQR)	6.0 (3.7-9.9)	5.1 (3.5-8.2)	N/A
Mean \pm SD	7.5 \pm 5.5	5.7 \pm 2.8	0.02‡ (95% CI 0.28, 3.24)
ALC ($\times 10^9/L$ cells)			
Median (IQR)	1.9 (1.1-2.9)	1.6 (1.2-2.5)	N/A
Mean \pm SD	2.2 \pm 1.5	2.1 \pm 1.7	0.8‡ (95% CI -0.78, 0.90)
Chest radiograph characteristic [¶] , n (%)			
Normal Lung Parenchymal	252 (99.2)	2 (0.8)	N/A
Lobar Consolidation	54 (100)	0 (0)	N/A
Pleural Effusion with or without consolidation	21 (100)	0 (0)	N/A
Heterogeneous Ill-defined opacities	3 (15.8)	16 (84.2)	N/A
Fluid overload features	15 (100)	0 (0)	N/A
Predominant reticular opacities	68 (100)	0 (0)	N/A
Others	39 (100)	0 (0)	N/A
Radiograph not available	8 (100)	0 (0)	N/A

*Plus-minus values are mean \pm SD. SARI denotes severe acute respiratory illness, ILI influenza like illness, DVF dengue fever or viral fever like illness, COPD chronic obstructive pulmonary disease, CKD chronic kidney disease, ESRD end-stage renal disease, WBC white blood cell, ANC absolute neutrophil count, ALC absolute lymphocyte count, and CI confidence interval. Fever, hypoxia, WBC, ANC, and ALC were all initial parameters upon admission. †Variables were compared with the Chi-Square test. ‡Variables were compared with student's t tests. §Total numbers not complete (11 missing data) due to certain cases were unable to obtain history such as delirium, or loss of consciousness. ¶. The first radiograph prior to admission was analysed.

Table 3: Multivariate analysis of selected variables (SARI, ILI & DVF)*

Variables	Co-efficient	Wald	P Value	OR	CI 95%
Fever	0.55	1.11	0.29	1.73	0.63 - 4.78
Hypoxia without dyspnoea	2.23	17.19	<0.01	9.27	3.24 - 26.56
Preceding URTI	0.20	0.68	0.77	1.22	0.32 - 4.63
Cough	0.58	1.03	0.31	1.78	0.58 - 5.41
ANC $\geq 10 \times 10^9$ /L cells	-2.22	4.37	0.04	0.11	0.01 - 0.87

*SARI denotes severe acute respiratory illness, ILI influenza like illness, DVF dengue fever or viral fever like illness, URTI upper respiratory tract infection, ANC absolute neutrophil count, OR odd ratio, and CI confidence interval. (Hosmer–Lemeshow Chi-squared=0.81, p=0.99).

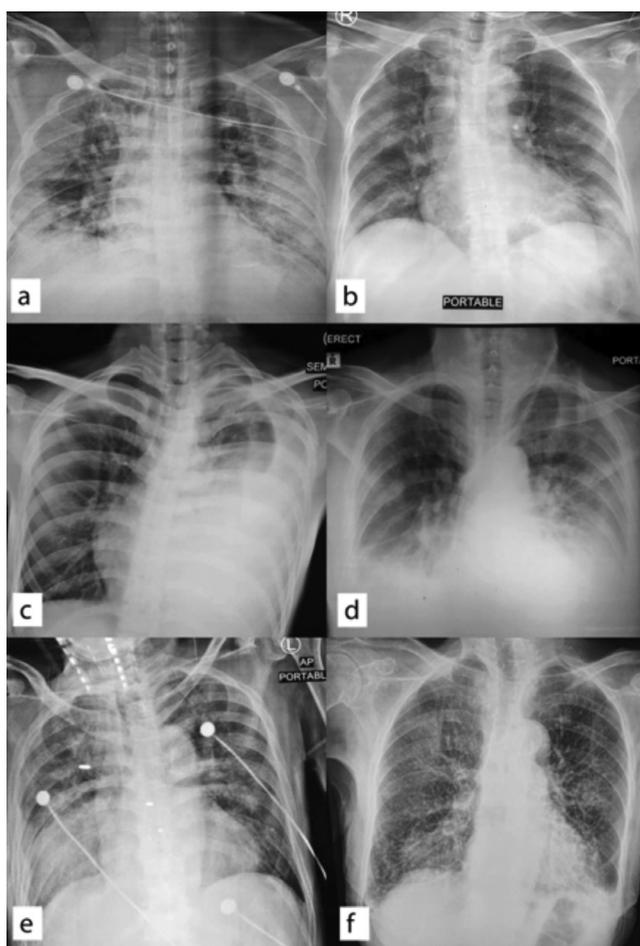


Figure 1. (a and b) Heterogeneous Ill-defined opacities. (c) Unilateral pleural effusion. (d) Fluid overload features. (e) Lobar consolidation. (f) Predominant reticular opacities.

Table S1. Dengue Serology Result*

Dengue Serology	Day of illness test was done (mean \pm SD)	COVID-19 not detected	COVID-19 detected
All Negative	4.6 \pm 1.3	7	1
IgG only Positive	4.8 \pm 1.3	12	0
IgM only Positive	7.3 \pm 2.1	3	0
IgM and IgG Positive	6.8 \pm 3.0	5	0
Ns1 Antigen only Positive	4.3 \pm 1.5	11	0
Ns1 Antigen and IgG Positive	5.8 \pm 1.3	5	0
Ns1 Antigen and IgM Positive	6.0 \pm 1.8	4	0
All Positive	4.0 \pm 1.0	3	0
Result not available	-	13	0

*All dengue serology tests were performed with a rapid test kit.

Table S2. Univariate analysis of variables (SARI, ILI & DVF)*

Variables	Co-efficient	Wald	P Value	OR	CI 95%	
					Lower	Upper
Fever	0.71	2.19	0.14	2.04	0.79	5.25
Hypoxia	0.80	1.98	0.10	2.01	0.86	5.77
Preceding URTI	0.14	0.05	0.83	1.15	0.33	4.09
Cough	0.431	0.65	0.42	1.54	0.54	4.40
Dyspnoea	-0.85	2.55	0.11	0.43	0.15	1.22
Hypoxic without dyspnoea	1.97	15.57	<0.01	7.18	2.70	19.13
WBC	-0.09	2.77	0.10	0.92	0.82	1.02
WBC \geq 15 x10 ⁹ /L cells	-1.32	1.62	0.20	0.27	0.04	2.04
ANC	-0.08	1.84	0.18	0.92	0.82	1.04
ANC \geq 10 x10 ⁹ /L cells	-1.70	2.70	0.10	0.18	0.02	1.39
ALC	-0.03	0.03	0.87	0.97	0.70	1.36
Medium Risk	3.56	36.75	<0.01	35.77	11.25	113.71

*SARI denotes severe acute respiratory illness, ILI influenza like illness, DVF dengue fever or viral fever like illness, WBC white blood cell, ANC absolute neutrophil count, and CI confidence interval. All were initial parameters upon admission.

Table S3. COVID-19 result of neighbouring patient under surveillance*

Case ID	Duration of contact* (Hour)	COVID-19 test from last contact (Day)	COVID-19 Result	Symptoms at day 14
9	45	6	Negative	Asymptomatic
65	34	5	Negative	Asymptomatic
31	17	8	Negative	Asymptomatic
42	15	6	Negative	Asymptomatic
27	41	8	Negative	Asymptomatic
43	11	7	Negative	Asymptomatic
76	12	6	Negative	Asymptomatic
82	3	6	Negative	Asymptomatic
67	20	7	Negative	Asymptomatic
106	19	6	Negative	Asymptomatic
155	29	6	Negative	Asymptomatic
626	33	7	Negative	Asymptomatic
629	26	7	Negative	Asymptomatic
630	25	7	Negative	Asymptomatic

*Patients were kept minimum 1 meter apart. These include bed and personal belongings.

Level of emotional intelligence among nurses

Chang Angelna, Yung Wei Lai, Swee Geok Lim

ABSTRACT

Background: Emotional intelligence (EI) is defined as the comprehension, use and the management of one's emotions in a positive manner to reduce stress, communicate efficiently, empathise with others, overcome challenges, and resolve conflicts. EI is important among nurses as it influences their decision-making abilities, clinical judgment, and well-being that directly affect the quality of patient care and outcome.

Objective: The objective of this study was to determine the EI level and its association with demographic variables among nurses in a private hospital in Petaling Jaya, Selangor.

Methods: This was a cross-sectional, descriptive study involving 130 nurses at one of the private hospitals in Petaling Jaya, Selangor, through simple random sampling. Questionnaire consists of Part A (demographic data) and Part B (Wong and Law's Emotional Intelligence scale (WLEIS), self-assessment tool that consists of 16 items on four components inclusive of self-emotions appraisal (SEA), regulation of emotion (ROE), use of emotion (UOE), and other's emotion appraisal (OEA) on a set of 7-Likert scale).

Results: Findings showed that 63.1% ($n = 82$) scored high EI. Nurses' age and years of nursing experience are significantly associated with their level of EI. No association is found on the nurses' level of EI with their gender, ethnicity, highest nursing education level, marital status, and current work setting. The null hypothesis was rejected.

Conclusion: Findings showed that most of the nurses have high EI. There is a significant association between the level of EI and demographic variables such as age and years of nursing experience.

Keywords: Emotional intelligence, nurses, emotion, self-emotions appraisal, regulation of emotion, use of emotion

Introduction

The nursing profession involves a selfless act of caring for healthy and sick individuals as well as promoting health to the community in collaboration with various multidisciplinary teams to improve patient outcomes. Hence, emotional intelligence (EI) is important for nurses as it influences their decision-making abilities, clinical judgment, and well-being that directly affect the quality of patient care and outcome. EI or in other words also known as emotional quotient (EQ), is defined as the comprehension, using, and managing of one's emotions in a positive manner to reduce stress, able to communicate efficiently, empathise with others, overcome challenges, and to resolve conflicts (Segal et al., 2019). This theory was published in the mid-1990s by Daniel Goleman, an American psychologist, where he had stated that EI is a set of attributes that influence a person's happiness and professional success (Wilding, 2017).

Along with the rapid worldwide expansion of the healthcare system, it has significantly increased the demand of the nursing workforce to meet healthcare demand. The need for more nurses is necessary in order to meet patient's needs and to ensure a high satisfaction level towards nursing care provided (Permarupan et al., 2020). However, in order to address shortage of nurses, corrective measures such as longer working hours or more frequent overtime, might result in exhaustion or even burnout among nurses. Relevant to these, EI is truly essential for nurses' psychological well-being while delivering quality nursing care (Szczygiel & Mikolajczak, 2018). Various studies have shown that

Nursing Division, School of Health Sciences, International Medical University, Kuala Lumpur, Malaysia

Address for Correspondence:

Lim Swee Geok, Nursing Division, International Medical University, 126 Jalan Jalil Perkasa 19, Bukit Jalil, 57000 Kuala Lumpur, Malaysia
Tel: 03-27317497 E-mail: sweegeok_lim@imu.edu.my

nurses' EI influences nurses' well-being and patient outcome, as well as its role in the progression towards care of patient-centered concept as EI assists individuals in managing emotions and reacting to other's emotions. Ng et al. (2014) had conducted a cross-sectional study in a Malaysian hospital to determine the mediating role of work locus of control on the relationship of EI, organisational citizenship behavior, and mental health among nurses. The study was conducted among 242 nurses who work in a hospital in Malaysia. Findings showed that nurse's work behaviour and mental health are influenced by EI components. Thus, it is concluded that EI should be incorporated into nurses' training. In addition, studies have shown a significant relationship between the level of EI and age, years of experience, marital status (Srinivasan & Samuel, 2016), types of the hospital (Tomar, 2016), and gender (Hua et al., 2019).

Despite the importance of EI in the nursing profession and healthcare industry, few studies have been carried out to study the association between the level of nurses' EI and their demographic information (Ng, Ke & Raymond, 2014). The understanding between these associations may assist nursing managers and the organisation in developing effective strategies to improve nurses' EI to meet the needs of their patients and nursing staff, along with achieving the organisational goals.

Hence, this study will enable nurses to understand the importance of EI in their daily interactions with patients, peers, and other healthcare professionals. Moreover, this will allow nursing managers to implement effective strategies in enhancing nurses' EI to improve the quality of patient care and outcome, as well as provide recommendations to the healthcare institution to improve nurses EI. Besides that, this will create awareness in the society that EI enhances an

individual's decision-making, judgment, and well-being. The purpose of this study was to determine the level of EI, as well as the association between the level of EI and demographic variables among nurses in a private hospital in Petaling Jaya, Selangor.

Methods

Study design, setting and sample

A descriptive, cross-sectional, quantitative study was used to determine the level of EI among nurses and the association between the level of EI and demographic variables among nurses in a private hospital, Petaling Jaya, Selangor from January to February 2020.

The target population of this study was registered nurses from the medical/surgical and critical care disciplines who have more than one year of working experience as those who have less than a year of working experience in the clinical setting may influence the result of the findings as they are novice nurses and still adapting to the new clinical environment.

The total number of registered nurses from the general setting (medical-surgical) and critical care setting (Intensive Care Unit, ICU/High Dependency Unit, HDU/Neonatal Intensive Care Unit, NICU/Coronary Care Unit, CCU/Accident and Emergency, A&E) was 169. Using the Raosoft sample size calculator software, with total registered nurses of 169 participants, 5% margin error, 95% confidence level, and 50% distribution rate, the sample size recommended was 118. However, a 10% attrition rate was added to the calculated sample size ($n = 12$), which makes the final sample size of 130. A simple random sampling using Microsoft Excel was used to sample 130 participants randomly from a total of 169 participants.

Inclusion and exclusion criteria

The inclusion criteria for this study included registered nurses who have at least one year of working experience in medical-surgical or critical care settings. Conversely, the exclusion criteria for this study were the registered nurses who have less than one year of working experience in medical-surgical or critical care settings, nurses of the managerial level, and those who had participated in the pilot study.

Ethical considerations

Ethical approval was obtained from the ethics committee of the International Medical University (BN 1/20 (PR-51)), the management of the selected private hospital, and consent was obtained from the respondents prior to the conduct of the study. To ensure the anonymity and confidentiality of the respondents, the completed questionnaires were sealed in an envelope.

Measurement and instrument

The questionnaire consisted of two sections to be answered, Part A, which is the demographic data, and Part B, the Wong and Law's Emotional Intelligence scale, WLEIS (Wong & Law, 2002). Part A is the demographic data that consists of participants' age, gender, ethnicity, years of nursing experience, highest nursing education level, marital status, and current work setting. Whereas, Part B is the WLEIS, which measures the level of EI among registered nurses in a private hospital in Petaling Jaya, Selangor. WLEIS was fully adopted for this study with written permission granted by both researchers Wong Chi Sum and Kenneth Law. The self-assessment tool consisted of 16 items that measured the level of EI

in four components, which are self-emotions appraisal (SEA) - 4 items, regulation of emotion (ROE) - 4 items, use of emotion (UOE) - 4 items and other's emotion appraisal (OEA) - 4 items. Respondents' level of EI was measured using the 7-points Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Validity and reliability testing

A pilot study on 30 nurses was carried out to determine the reliability and validity of the instrument in the month of November. As the result of the pilot study showed a Cronbach's alpha, value of 0.907, which exceeds the acceptable level of 0.70 (Polit and Beck, 2018), therefore, the instrument for the study was considered reliable. The questionnaire was reviewed and validated by a three-member panel of experts who comprised of the Director of Nursing, Head of Nursing Education department, and Senior Manager of Clinical Research Centre. No amendments were required as they agreed that the contents of the questionnaire were appropriate to measure the research variables.

Data analysis

Data collected were analysed using IBM SPSS Statistics Version 25.0. Descriptive statistics, including frequency, mean, standard deviation, percentages, were used to analyse the demographic and the research variables. Table format was then used to illustrate the findings of the study according to the American Psychological Association (APA) format. As the data was not normally distributed, a non-parametric test, Mann-Whitney U, was used to determine the association between the level of EI and nurses' demographic data.

Results

Demographic data

The socio-demographics of nurses are summarised in Table 1. The age of participants ranged from 22 to 51 years. Therefore, the participant's age was categorised into two groups according to the mean age of 28 years. A total of 50.8% ($n = 66$) of participants aged between 22-27 years and 49.2% ($n = 64$) aged between 28-51 years.

In this research study, majority of the participants were female, 84.6% ($n = 110$), whereas, the minority are male that made up of 15.4% ($n = 20$). Out of the total 130 participants, 40.8% ($n = 53$) were Malay in ethnicity, and 59.2% ($n = 77$) were non-Malay.

The study results showed that the participants' years of nursing experience ranged from 1 to 30 years. Therefore, they were categorised into two groups based on the mean of 6 years. 55.4% ($n = 72$) have less than 6 years of nursing experience, whereas 44.6% ($n = 58$) have more or equal to 6 years of nursing experience. 19.2% ($n = 25$) of the participants hold the education qualification of Bachelors' in Nursing, whereas the remaining 80.8% ($n = 105$) were of Diploma in Nursing holders. None had a Masters' in Nursing qualification.

Majority of the participants were single which made up the 60.8% ($n = 79$), and 39.2% ($n = 51$) were others. Finally, the questionnaires were equally distributed to general medical/surgical ward 50% ($n = 65$) and critical care areas such as ICU/HDU/CCU/NICU/A&E, respectively, which made up the total of 100% ($n = 130$).

Table 1: Social demographic data of nurses (n = 130)

Variables	Frequency	%	M±SD
Age			28.55±5.40
< 28	66	(50.8%)	
≥ 28	64	(49.2%)	
Gender			
Male	20	(15.4%)	N/A
Female	110	(84.6%)	N/A
Ethnicity			
Malay	53	(40.8%)	N/A
Non-Malay	77	(59.2%)	N/A
Nursing experience (years)			6.35±5.14
< 6	72	(55.4%)	
≥ 6	58	(44.6%)	
Highest nursing education level			
Diploma in Nursing	105	(80.8%)	N/A
Bachelor's in Nursing	25	(19.2%)	N/A
Marital status			
Single	79	(60.8%)	N/A
Others	51	(39.2%)	N/A
Current work setting			
General setting (Medical/ Surgical Ward)	65	(50%)	N/A
Critical Care setting (ICU/ HDU/CCU/ NICU/ A&E)	65	(50%)	N/A

Level of emotional intelligence among nurses

There are four dimensions on a set of 7-point Likert scale to measure the level of EI among nurses, as shown in Table 2. The four dimensions are self-emotions appraisal (SEA), regulation of emotions (ROE), use of emotion (UOE), and others' emotion appraisal (OEA). Likert scale consisted of the following: (1 - Strongly disagree, 2 - Disagree, 3 - Slightly disagree, 4 - Neither agree nor disagree, 5 - Slightly agree, 6 - Agree, 7 - Strongly agree). Total EI scores for nurses ranged from 55 to 112 with the mean score of 89.92, and standard deviation of 10.30. There was no classification on the level of EI stated in the WLEIS. Therefore, the higher the total EI scores than the mean value indicated higher EI.

SEA dimension in Table 2 comprises of 4 items (Q1-Q4). The item that has the highest mean and standard deviation was Q4, "I always know whether I am happy or not" (M = 5.98, SD = 1.02), followed by Q3, "I really understand what I feel" (M = 5.88, SD = 1.01), subsequently Q2, "I have a good understanding of my own emotions" (M = 5.82, SD = 0.97, and the lastly Q1, "I have a good sense of why I feel certain feelings most of the time" (M = 5.70, SD = 0.90). The mean of the total score for SEA dimension was 5.48±0.77, with scores ranging from 3.25 to 7.00.

Meanwhile for ROE dimension as shown in Table 2, it comprised of 4 items (Q5-Q8). The item that had the highest mean and standard deviation was Q8, "I have a good understanding of the emotions of people around me" (M = 5.61, SD = 1.02), followed by Q7,

"I am sensitive to the feelings and emotions of others" (M = 5.50, SD = 1.11), subsequently Q6, "I am a good observer of other's emotions" (M = 5.46, SD = 1.01), and the lastly Q5, "I always know my friends' emotions from their behaviour" (M = 5.36, SD = 1.05). The mean of the total score for ROE dimension was 5.48 (SD 0.81), with scores ranging from 3.00 to 7.00.

The UOE dimension in Table 3 comprised of 4 items (Q9-Q12). The item that has the highest mean and standard deviation was Q12, "I would always encourage myself to try my best" (M = 6.00, SD = 0.89), followed by Q9, "I always set goals for myself and then try my best to achieve them" (M = 5.85, SD = 1.06), subsequently Q11, "I am a self-motivated person" (M = 5.69, SD = 1.10, and the lastly Q10, "I always tell myself I am a competent person." (M = 5.57, SD = 1.09). The mean of the total score for UOE dimension was 5.78±0.89, with scores ranging from 1.75 to 7.00.

Lastly, in the OEA dimension, as shown in Table 3, it comprised of 4 items (Q13-Q16). The item that has the highest mean and standard deviation was Q13, "I am able to control my temper so that I can handle difficulties rationally" (M = 5.45, SD = 1.10), followed by Q14, "I am quite capable of controlling my own emotions" (M = 5.43, SD = 1.08), subsequently Q15, "I can always calm down quickly when I am very angry" (M = 5.32, SD = 1.23, and the lastly Q16, "I have good control of my emotions" (M = 5.29, SD = 1.12). The mean of the total score for OEA dimension was 5.38±1.00, with scores ranging from 1.25 to 7.00.

Table 2: Self-emotions appraisal (SEA) and Regulation of emotion (ROE) dimensions in level of emotional intelligence among nurses (n = 130)

Self-emotions appraisal (SEA) Items	1 Strongly disagree	2 Disagree	3 Slightly disagree	4 Neither agree nor disagree	5 Slightly agree	6 Agree	7 Strongly agree	M ± SD
Q4. I always know whether I am happy or not	0	1	4	6	16	62	41	5.98±1.02
	(0%)	(0.8%)	(3.1%)	(4.6%)	(12.3%)	(47.7%)	(31.5%)	
Q3. I really understand what I feel	0	1	2	11	19	61	36	5.88±1.01
	(0%)	(0.8%)	(1.5%)	(8.5%)	(14.6%)	(46.9%)	(27.7%)	
Q2. I have a good understanding of my own emotions	0	1	1	12	23	63	30	5.82±0.97
	(0%)	(0.8%)	(0.8%)	(9.2%)	(17.7%)	(48.5%)	(23.1%)	
Q1. I have a good sense of why I feel certain feelings most of the time	0	0	3	10	30	67	20	5.70±0.90
	(0%)	(0%)	(2.3%)	(7.7%)	(23.1%)	(51.5%)	(15.4%)	
TOTAL								5.84±0.77

(cont'd) Table 2: Self-emotions appraisal (SEA) and Regulation of emotion (ROE) dimensions in level of emotional intelligence among nurses (n = 130)

Regulation of emotion (ROE) Items	1 Strongly disagree	2 Disagree	3 Slightly disagree	4 Neither agree nor disagree	5 Slightly agree	6 Agree	7 Strongly agree	M ± SD
Q8. I have a good understanding of the emotions of people around me	0	0	6	14	24	67	19	5.61±1.02
	(0%)	(0%)	(4.6%)	(10.8%)	(18.5%)	(51.5%)	(14.6%)	
Q7. I am sensitive to the feelings and emotions of others	0	3	5	14	26	66	16	5.50±1.11
	(0%)	(2.3%)	(3.8%)	(10.8%)	(20%)	(50.8%)	(12.3%)	
Q6. I am a good observer of other's emotions	0	1	6	14	31	67	11	5.46±1.01
	(0%)	(0.8%)	(4.6%)	(10.8%)	(23.8%)	(51.5%)	(8.5%)	
Q5. I always know my friends' emotions from their behaviour	0	1	6	18	39	52	14	5.36±1.05
	(0%)	(0.8%)	(4.6%)	(13.8%)	(30%)	(40%)	(10.8%)	
TOTAL								5.48±0.81

Table 3: Use of emotion (UOE) and Other's emotion appraisal (OEA) dimensions in level of emotional intelligence among nurses (n = 130)

Use of emotion (UOE) Items	1 Strongly disagree	2 Disagree	3 Slightly disagree	4 Neither agree nor disagree	5 Slightly agree	6 Agree	7 Strongly agree	M ± SD
Q12. I would always encourage myself to try my best	0 (0%)	1 (0.8%)	1 (0.8%)	5 (3.8%)	20 (15.4%)	66 (50.8%)	37 (28.5%)	6.00±0.89
Q9. I always set goals for myself and then try my best to achieve them	1 (0.8%)	2 (1.5%)	1 (0.8%)	8 (6.2%)	18 (13.8%)	69 (53.1%)	31 (23.8%)	5.85±1.06
Q11. I am a self-motivated person	2 (1.5%)	1 (0.8%)	0 (0%)	13 (10%)	29 (22.3%)	57 (43.8%)	28 (21.5%)	5.69±1.10
Q10. I always tell myself I am a competent person	0 (0%)	1 (0.8%)	7 (5.4%)	12 (9.2%)	28 (21.5%)	61 (46.9%)	21 (16.2%)	5.57±1.09
TOTAL								5.78±0.89

(cont'd) Table 3: Use of emotion (UOE) and Other's emotion appraisal (OEA) dimensions in level of emotional intelligence among nurses (n = 130)

Other's emotion appraisal (OEA) Items	1 Strongly disagree	2 Disagree	3 Slightly disagree	4 Neither agree nor disagree	5 Slightly agree	6 Agree	7 Strongly agree	M ± SD
Q13. I am able to control my temper so that I can handle difficulties rationally	1 (0.8%)	2 (1.5%)	5 (3.8%)	12 (9.2%)	32 (24.6%)	65 (50%)	13 (10%)	5.45±1.10
Q14. I am quite capable of controlling my own emotions	2 (1.5%)	0 (0%)	4 (3.1%)	14 (10.8%)	37 (28.5%)	60 (46.2%)	13 (10%)	5.43±1.08
Q15. I can always calm down quickly when I am very angry	0 (0%)	4 (3.1%)	8 (6.2%)	17 (13.1%)	32 (24.6%)	51 (39.2%)	18 (13.8%)	5.32±1.23
Q16. I have good control of my emotions	1 (0.8%)	2 (1.5%)	6 (4.6%)	17 (13.1%)	38 (29.2%)	55 (42.3%)	11 (8.5%)	5.29±1.12
TOTAL								5.38±1.00

Comparison of four dimensions of emotional intelligence

A comparison of the mean between four dimensions of EI is shown in Tables 2 and 3. SEA had the highest mean and standard deviation ($M = 5.84$, $SD = 0.77$),

followed by UOE ($M = 5.78$, $SD = 0.89$), ROE ($M = 5.48$, $SD = 0.81$), and lastly OEA ($M = 5.38$, $SD = 1.00$). The overall EI mean and the standard deviation was 5.62 and 0.64, with scores ranging from 3.44 and 7.00.

Association between the level of emotional intelligence and demographic variables among nurses

The association between the level of EI and demographic variables among nurses were analysed using the non-parametric test by Mann Whitney U. The overall mean score for EI is 89.92, with a score range of 55-112.

In this study, Table 4 showed that older nurses have a higher level of EI than nurses who are younger. Therefore, the finding showed that there is a significant

association between the level of EI according to age ($p \leq .001$, $z = -4.574$).

In addition, Table 4 showed that nurses with ≥ 6 years of nursing experience had a higher level of EI than nurses who had < 6 years of nursing experience. Meanwhile, nurses with < 6 years of nursing experience had lower EI levels as compared to nurses with ≥ 6 years of nursing experience. Therefore, the finding showed that there is a significant association between the level of EI and years of nursing experience ($p \leq .001$, $z = -4.886$).

Table 4: Association between Demographic Variables and Emotional Intelligence Score (n = 130)

Variables	Emotional Intelligence Score		p-value	z
	n (%) < 89	n (%) ≥ 89		
Age			$\leq .001^*$	-4.574
< 28	37 (28.5%)	29 (22.3%)		
≥ 28	11 (8.5%)	53 (40.7%)		
Gender			0.487	-.695
Male	6 (4.6%)	14 (10.8%)		
Female	42 (32.3%)	68 (52.3%)		
Ethnicity			0.951	-.062
Malay	19 (14.6%)	34 (26.2%)		
Non-Malay	29 (22.3%)	48 (36.9%)		
Years of nursing experience			$\leq .001^*$	-4.886
< 6	40 (30.8%)	32 (24.6%)		
≥ 6	8 (6.2%)	50 (38.5%)		
Highest nursing education level			0.306	-1.025
Diploma in Nursing	41 (31.5%)	64 (49.2%)		
Bachelor's in Nursing	7 (5.4%)	18 (13.8%)		
Marital status			0.088	-1.706
Single	35 (26.9%)	44 (33.8%)		
Others	13 (10.0%)	38 (29.3%)		
Current work setting			0.717	-.362
General setting (Medical/Surgical Ward)	23 (17.7%)	42 (32.3%)		
Critical Care setting (ICU/ HDU/ CCU/ NICU/ A&E)	25 (19.2%)	40 (30.8%)		

Discussion

Demographic data

The total number of nurses who participated in this study was 130. The majority of the nurses were female (84.6%), and the minority were male (15.4%). This is similar to the study conducted by Hua et al. (2019), where their studies comprised of 99.31% female nurses and 0.69% male nurses. In this study, there were more nurses whose age was <28 years (50.8%), compared to those \geq 28 years (49.2). However, another study showed that there were 57.73% of nurses whose age ranged from 20-30 years, 31.62% of those whose age ranged from 31-40 years, and only 10.65% of nurses with age ranging from 41-50 years and above (Hua et al., 2019). This also indicated that both our study and other study were similar, where the number of respondents comprised of younger nurses compared to the older nurses.

In addition, most nurses were non-Malay (59.2%), as nurses who are Malay only comprised of 40.8% in this study. There was a lack of related studies in Malaysia or other Asian countries. Hence, the comparison could not be carried out. Besides that, most nurses were those who had < 6 years of nursing experience (55.4%), while the minority of nurses were those who have \geq 6 years of nursing experience (44.6%). However, other study findings showed that their majority of the respondents were mostly nurses who work \leq 6 years (37.3%), followed by 7-10 years (32.6%), and \geq 12 years (30.1%) (Konstantinou et al., 2017).

Moreover, the highest nursing education level of nurses who participated in this study was mostly Diploma in Nursing (80.8%), and only a few hold a bachelor's degree in nursing (19.2%). In contrast, a study

conducted by Kahraman and Hicdurmaz (2015) showed that 58.97% of nurses hold a Bachelor of Science, 22.44% medical vocational schools, 15.06% associate degree and 3.54% Masters or doctoral degree.

Nurses in this study were mostly single (60.8%), while others are not (39.2%). In contrast, most of the respondents in other studies comprised of 64.8% of nurses who are married, 30.9% single, 3.8% divorced, and 0.5% widowed (Konstantinou et al., 2017).

Lastly, this study included 50% of nurses who worked in general settings (medical/surgical) and 50% of nurses who worked in critical care settings. Nevertheless, Hua et al. (2019) showed 32.99% of their respondents were from medical unit, 29.55% surgical unit, 6.87% paediatric unit, 4.47% obstetrics and gynaecology unit, 6.19% operating room, 6.53% emergency room, 5.50% intensive care unit, and 7.90% out-patient department.

Level of emotional intelligence among nurses

Nurses scored a higher mean value and standard deviation (5.84 ± 0.77) in the dimension of SEA but scored the lowest mean value and standard deviation in the dimension of OEA (5.38 ± 1.00). This showed that nurses had higher self-emotion awareness due to their profession itself that require them to assess, understand and express their feeling in their daily interactions with patients' and their family as well as other healthcare personnel that led to higher scores in self-emotional awareness. Similarly, in the study by Hua et al. (2019), nurses had higher mean value and standard deviation (22.80 ± 3.48) in the dimension of SEA. In contrast, it was reported that nurses scored lower mean value and standard deviation (19.20 ± 4.33) in the dimension of ROE.

Besides that, study findings showed that nurses' EI mean value, and standard deviation scores in other dimensions, UOE and ROE, were 5.78 ± 0.89 and 5.48 ± 0.81 , respectively. Whereas study findings by Hua et al. (2019), reported a mean value and standard deviation for OEA and UOE, as 19.57 ± 5.45 and 19.76 ± 3.94 respectively. In contrast with our study, nurses were reported to have lower EI scores in the dimension of OEA. Hua et al. (2019) stated that the overwhelming workload of nurses might lead to a lack of time and attention for their patients. Hence, nurses may lose their abilities to discover and appraise others' emotions caused by a lack of communication.

Moreover, the overall mean score of EI in this study was 89.92, and a standard deviation of 10.30. Correspondingly in the study by Hua et al. (2019), the mean score of EI was 81.32 and a standard deviation of 12.13. It was reported that a high emotional awareness allowed the nurses to regulate their emotions appropriately despite encountering tough situations in delivering quality nursing care.

Association between level of emotional intelligence and demographic variables among nurses

This study revealed that 40.7% ($n = 53$) of the nurses who were older had higher EI level as compared to the younger nurses that made up of 28.5% ($n = 37$) from the total target population of the study. Correspondingly, a study conducted by Srinivasan and Samuel (2016) on EI among 152 employed nurses in 10 hospitals in Villupuram District, India, showed that respondents who are older had a higher level of EI as compared to the younger respondents. Besides that, Hua et al. (2019) had carried out a descriptive study to determine the level of

nurses' emotional intelligence among 298 nurses at two tertiary hospitals in Dali, Yunnan, China. It was found that older individuals scored higher EI than younger individuals. This revealed that older nurses display a higher level of EI compared to younger nurses.

Meanwhile, more than half of the nurses 38.5% ($n = 50$) in this study who had more years of nursing experience had displayed higher EI level as compared to the group of nurses who had less years of nursing experiences, which made up of a total of 30.8% ($n = 40$) from the targeted population in this study. Similarly, Srinivasan and Samuel (2016) in their study on EI among 152 employed nurses in 10 hospitals in Villupuram District, India, found that nurses who had more years of working experience had a higher EI as compared to nurses who were new to the profession. In addition, another study by Kahraman and Hicdurmaz (2015) on identifying EI skills of Turkish clinical nurses based on their sociodemographic variables, found that there was a significant association between EI and years of working experience. Nurses who were more experienced had a higher level of EI.

Conclusion

EI is truly essential for nurses' psychological well-being while delivering quality nursing care. The majority of nurses in this private hospital in Petaling Jaya, Selangor had a high level of EI. It was shown that the demographic variables, namely age and years of nursing experiences, were significantly associated with the level of EI. Hence, it is recommended that healthcare and education institutions carry out more training in recognising and assessing one's emotions, such as courses or workshops that teaches how to interpret one's body

language, effective communication skills, and strategies in managing difficult situations. As a result, nurses will be better equipped and more confident in dealing with patients in any situation especially if they are nursing leaders. At the same time, hopefully this can result in better patient care and health outcomes. Furthermore, a more diverse population should be considered to obtain generalisability of the study findings other than considering stratified sampling method to study the relationship between the level of EI, gender, the highest level of education, and marital status for more accurate results pertaining to a specific demographic variable. Lastly, upcoming studies should also consider looking into other possible influencing factors that can impact the nurses' EI level, such as culture, leadership styles and type of hospital settings.

Limitation

One of the limitations of the study was the study population where it was confined only to nurses from a private hospital in Petaling Jaya, Selangor with a sample size of 130. Therefore, the findings were insufficient to represent nurses in Malaysia due to the small sample size and lack of access to other private and government hospitals.

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REFERENCES

- Ahmad, J., & Hashmi, M. S. (2015). Relative importance of emotional intelligence's dimensions in contributing to dimensions of job performance. *Journal of Basic & Applied Sciences*, 11, 596-603. DOI: <http://dx.doi.org/10.6000/1927-5129.2015.11.80>
- Basogul, C., & Ozgur, G. (2016). Role of emotional intelligence in conflict management strategies of nurses. *Asian Nursing Research*, 10, 228-233. <https://doi.org/10.1016/j.ANR.2016.07.002>
- Bonnel, W., & Smith, K. V. (2014). *Proposal writing for nursing capstones and clinical projects*. United States of America: Springer Publishing Company.
- Conroy, R. M. (2018). *The RCSI Sample size handbook*. Retrieved from file:///C:/Users/laiyw/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/RCSISamplesizeguide2018.pdf
- Gerhardt, P. (2015). *Emotional intelligence workbook*. United States of America: Lulu Press.
- Emotional intelligence. (2019). In *Cambridge Dictionary*. Retrieved from, <https://dictionary.cambridge.org/dictionary/english/emotional-intelligence?q=Emotional+intelligence>
- Geun, G. H., & Eunok, P. (2019). Influence of emotional intelligence, communication, and organizational commitment on nursing productivity among Korean nurses. *Journal of Korean Academy of Community Health Nursing*, 30(2), 222-233. <https://doi.org/10.12799/jkachn.2019.30.2.226>
- Glasper, A., & Rees, C. (2017). *Nursing and healthcare research at a glance*. Retrieved from <https://books.google.com.my/books?id=8ZktCwAAQBAJ&pg=PA65&dq=cro#v=onepage&q&f=false>
- Goleman, D. (2017). *What makes a leader?* United States of America: Harvard Business School Publishing Corporation.
- Hua, Y., Uddin, M. A., & Bhuiyan, A. J. (2019). Emotional intelligence of nurses in tertiary hospitals in Dali, the People's Republic of China. *Advances in Bioscience and Bioengineering*, 7(3), 46-50.
- Kahraman, N., & Hicdurmaz, D. (2015). Identifying emotional intelligence skills of Turkish clinical nurses according to sociodemographic and professional variables. *Journal of Clinical Nursing*, 25, 1006-1015. <https://doi.org/10.1111/jocn.13122>
- Konstantinou, M. S., Efstathiou, A., Charalambous, G., Kaitelidou, D., & Jelastopulu, E. (2017). Emotional intelligence and its impact on the emotional factors among nurses. *Journal of Education, Society and Behavioural Science*, 23(3), 1-13. 10.9734/JESBS/2017/37818
- Maxfield, M. G., & Babbie, E. R. (2018). *Research methods for criminal justice and criminology* (8th ed.). United State: Cengage Learning.
- Nagel, Y., Towell, A., Nel, E., & Foxall, F. (2016). The emotional intelligence of registered nurses commencing critical care nursing. *Curationis*, 39(1), 1-7. <https://doi.org/10.4102/curationis.v39i1.1606>

- Nair, M. A., & Lee, P. (2016). Emotional intelligence in nursing. *IOSR Journal of Nursing and Health Science*, 5(6), 38-42. <https://doi.org/10.9790/1959-0506073842>
- Ng, S. M., Ke, G. N., & Raymond, W. (2014). The mediating role of work locus of control on the relationship among emotional intelligence, organisational citizenship behaviours, and mental health among nurses. *Australian Journal of Psychology*, 66, 207-215. <https://doi.org/10.1111/ajpy.12049>
- Nurse. (2019). In *Cambridge Dictionary*. Retrieved from, <https://dictionary.cambridge.org/dictionary/english/nurse?q=nurses>
- Permarupan, P. Y, Al Mamun, A., Samy, N.K., Ahmad Saufi, R. & Hayat, N. (2020). Predicting Nurses Burnout through Quality of Work Life and Psychological Empowerment: A Study Towards Sustainable Healthcare Services in Malaysia. *Sustainability* 2020, 12(1), 388. <https://doi.org/10.3390/su12010388>
- Polit, D. F., & Beck, C. T. (2018). *Essential of nursing research: Appraising evidence for nursing practice* (9th ed.). New Delhi: Wolters Kluwer.
- Pokorna, A., Cetlova, L., Baumgartner, F., Juhasova, I., Dvorakova, V., Novakova, L., & Knight, A. (2016). The level of emotional intelligence of nurses providing care for older people in retirement homes in the Czech and Slovak Republic. *Mefanet Journal*, 4(2), 78-86. <http://mj.mefanet.cz/mj-20161028>.
- Reddington, S. (2017). *How to improve emotional intelligence: The best coaching, assessment & action book on working & developing high eq emotional intelligence quotient mastery of the full emotional intelligence spectrum*. Retrieved from <https://bit.ly/3tg2LA1>
- Segal, J., Smith, M., Robinson, L., & Shubin, J. (2019). Improving emotional intelligence (EQ). Retrieved from <https://www.helpguide.org/articles/mental-health/emotional-intelligence-eq.htm?pdf=13508>
- Srinivasan, K., & Samuel, A. U. (2016). A study on emotional intelligence of staff nurses working in Villupuram District. *Journal of Humanities and Social Science*, 21(3), 34-39. <https://doi.org/10.9790/0837-2103043439>
- Szczygiel, D.D. & Mikolajczak, M. (2018). Emotional Intelligence Buffers the Effects of Negative Emotions on Job Burnout in Nursing, *Frontier Psychology*, <https://doi.org/10.3389/fpsyg.2018.02649>
- Tomar, R. (2016). A study of emotional intelligence among nurses. *International Journal of Scientific Research and Education*, 4(4), 5204-5211. DOI: <http://dx.doi.org/10.18535/ijrsre/v4i04.16>
- Wilding, C. (2017). *Emotional intelligence: Use CBT to understand and manage your emotions and live a happier life*. Great Britain: John Murray Learning.
- Wong, C. S. & Law, K. S. (2002). The effects of leader and follower emotional intelligence on performance and attitude: An exploratory study. *The Leadership Quarterly*, 13, 243-274. [https://doi.org/10.1016/S1048-9843\(02\)00099-1](https://doi.org/10.1016/S1048-9843(02)00099-1)