Emerging Knowledge, Attitudes and Practices In Response to The Novel Coronavirus in Nursing Students: An Online-Based Cross-Sectional Study

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Fransiskus Xaverius Widiantoro [1], Yosi Maria Wijaya [1]

Abstract

Introduction: The knowledge, attitudes, and practices (KAP) in response to Covid-19 have not been measured previously in nursing institutions, which could be crucial to preventing a second wave of the Covid-19 pandemic in Indonesia. This study examined the KAP for Covid-19 among Indonesian nursing students during the rapid increase period.

Methods: An online-based cross-sectional design recruited nursing students using the authors' networks with lecturers and nursing institutions in Indonesia. After obtaining their consent, the participants completed an online survey to assess their socio-demographic details, habits, family history of chronic diseases, and KAP in response to Covid-19. Simple descriptive through to complex analyses and multivariate regression were carried out using SPSS 17.

Results: There were a total of 492 participants; 84.4% were female, most had a Bachelor's degree (71.3%) and the mean age was 23.9 years old. The majority had never smoked (94.3%), drank warm water everyday (61.6%), exercised (50.6%), did not have hypertension (96.3%), had no family history of select conditions (79.9%) and had not been diagnosed with diabetes (99.4%). The majority of participants (79.3%) had good knowledge, where the mean for attitude was 2.05 (SD=0.30) and the result for practices was 2.19 (SD=0.42). Multiple linear regression showed that males who were older were associated with a higher level of knowledge.

Conclusion: Our results found that the nursing students had good KAP scores regarding Covid-19. The development of effective health education programs to uphold their optimistic attitude and to maintain their good practices is needed.

Keywords

attitude, COVID-19, knowledge, nursing students, practice

INTRODUCTION

The world is currently witnessing an outbreak of a novel coronavirus SARS-COV-2 causing COVID-19 disease. The virus originated in Wuhan, China in the end of 2019 (Heymann and Shindo, 2020; Lipsitch, Swerdlow and Finelli, 2020; Liu SL and Saif L, 2020; Wu and McGoogan, 2020). The COVID-19 pandemic has a number of global effects (McKibbin and Fernando, 2020; Wyplosz, 2020). In response to this serious situation, the World Health Organization (WHO) declared it a public health emergency of international

[1] Santo Borromeus High School of Health Science, West Java, Indonesia

Corresponding Author:
Fransiskus Xaverius Widiantoro; Santo Borromeus High School of Health Science, West Java, Indonesia
Jl. Parahyangan Kavling 8 Blok B No.1, Kota Baru Parahyangan, Cipeundeuy, Padalarang, Cipeundeuy, Padalarang, West Bandung District, West Java 40553
Email: fwidhie@gmail.com

concern on January 30 and called for collaborative efforts of all countries to prevent the rapid spread of COVID-19 (Eurosurveillance Editorial Team, 2020).

Some prevention protocols prompted implementation for community to control the spread of the virus COVID-19, involving social distancing, hand washing, and lockdown procedures, but it has also resulted in creating public anguish and massive fear (Roy *et al.*, 2020), particularly among the unaffected population (Ilesanmi and Alele, 2016). In Indonesia, some unprecedented measures have been adopted to control the COVID-19 transmission including the suspension of public transportation, the closing of public spaces, close management of communities, and isolation and care for infected people and suspected cases. The battle against COVID-19 is still continuing in Indonesia. To guarantee the final success, nursing students' adherences especially to these control measures are essential, which is largely affected by their knowledge, attitudes, and practices (KAP) towards COVID-19 in accordance with KAP theory (Tachfouti *et al.*, 2012; Ajilore, Atakiti and Onyenankeya, 2017)

KAP regarding COVID-19 comes from different sources such as stereotypes concerning similar viral diseseas, governmental information, social media and Internet, previous personal experiences, and medical sources. The accuracy of these KAP may determine different behaviors about prevention and could vary in the population. In many cases, the absence of knowledge, or if most of the medical-related beliefs are actually misconstrued or false, these may carry a potential risk (Zhang *et al.*, 2020). Prior study found that attitudes towards government measures to contain the COVID-19 pandemic were highly associated with the level of knowledge (Zhong *et al.*, 2020). The higher levels of information and education were associated with more positive attitudes towards COVID-19 preventive practices (Kavoor, 2020; Zhong *et al.*, 2020). Perception of risk is also a key factor in commitment to prevention during outbreaks of global (Corrin *et al.*, 2017; Kavoor, 2020).

Health professionals, education providers, and health science students include nursing students have a key role in increasing the citizens' level of knowledge, the implementation of the pandemic measures, and compliance with them (Gohel *et al.*, 2020). Due to the lack of health care personnel, in many countries, final-year medical and nursing students were invited to voluntarily join the frontline healthcare workforce in the against COVID-19, in order to enhance health sectors during this public health crisis. In any case, researchers claim that, even if medical students are not involved in clinical practice during the COVID-19 outbreak, they play a key role in serving as information providers (Gohel *et al.*, 2020). Therefore, it is of major importance to avoid misconceptions and myths, identify students' possible knowledge gaps, encourage them as future health providers to search, critically appraise them, and adopt the new evidence in order to make informed (Patelarou *et al.*, 2017; Okan *et al.*, 2020).

Negative attitudes and practices toward imported groups, i.e., nursing students, can be predicted by various factors, including history of conflict, current competition over limited resources or lack of knowledge about a certain group (Esses *et al.*, 2005; Bilewicz, 2007; Zagefka *et al.*, 2017). An affective component of attitudes, and, along with stereotypes (cognitive components) and discrimination (behavioral component), describe the barriers in inter-group relations (Fiske, 1998). It is not necessarily resistant to sudden events or acute environmental changes (Butz and Yogeeswaran, 2011), we predict that COVID-19 outbreak can be a factor significant enough to influence social attitudes toward nursing students as a health care provider.

To date, there has been limited publish data on nursing students' population knowledge, attitudes, and practices toward COVID-19 in Indonesia. The novelty of this disease, along with its uncertainties, makes it critical for health authorities to plan appropriate strategies to prepare and manage community. It is therefore of utmost importance that the knowledge, attitudes and practices of the nursing students' be studied to guide these efforts.

To facilitate outbreak management of COVID-19 in Indonesia, there is an urgent need to understand the nursing students' awareness of COVID-19 at this critical moment. However, no study has yet analyzed the knowledge, attitude and practices prevention of the COVID-19 spread in nursing

students. This study was examined the knowledge, attitude, and practice towards COVID-19 of nursing students during the rapid rise period of the COVID-19 outbreak.

MATERIALS AND METHODS

Design

A correlative study with an online-based cross-sectional design was conducted immediately after the government announces COVID-19 as a pandemic in Indonesia.

Sample size

The number of participants was recruited basing on a power analysis. The confidence level of 95%, type I error rate of 5%, the power $1-\beta$ of 0.80, non-inferiority or superior margin of 0.50, and an alpha level of .05 will be set for the main and interaction effects. A number of 365 subjects were required after sample size calculation. Additional 110 subjects were included for considering withdraw rate with 30% in community study (Vandelanotte *et al.*, 2007).

Setting and Selection Procedure for Participants

Eligible participants were invited from the office affair or student unions of a school of health sciences in Indonesia by authors' networks. Eligibility criterions were Indonesia nationality, aged with 20 years or above, nursing students in diploma or bachelor nursing students, full-time students, understood the content of this study by read information in the first page of Google form and willing to participate with provide a written informed consent to this study. An exclusion criterion was included without access to Internet. The eligible participants were completed informed consent procedures.

Procedure Data Collection

This study was collected data by online approach because it was not feasible to do a direct institutional-based sampling survey during this outbreak period. Relying on the authors' networks with nursing institutions and lecturers in Indonesia, a semi-structured questionnaire was designed for the Google survey tool (Google Forms), and the generated link was shared on social media (i.e., Facebook, WhatsApp, Line and Twitter). The first page of Google Forms was contained a brief introduction on the background, objective, procedures, voluntary nature of participation, declarations of anonymity and confidentiality, and notes for filling in the questionnaire, as well as the link of the online questionnaire. Eligible participants were instructed to complete the questionnaire by clicking the link. Although the questionnaire was distributed by nursing students, we were not constricted our sample to West-Java nursing students only. Nursing students of other provinces were also eligible for this survey if they were willing to participate.

After get approval from the Ethics Committee, the eligible participants were answered a "yes-no" question to confirm their willingness to participate voluntarily. After confirmation of the question, the eligible participants were directed to complete the self-report questionnaire.

Measures

Socio-demographics and Habit

Socio-demographics variables were included age, gender, education levels, religions, and place of current residence. The habit was involved smoking history, drinking warm-water, and physical activity practice.

Knowledge, attitude, and practice of COVID-19

The instrument was adapted from developed study on Chinese residents' knowledge, attitudes and practices (KAP) towards COVID-19 in China (Zhong *et al.*, 2020). The questionnaire was translated into Indonesia version by Beaton et al. guidelines (Beaton *et al.*, 2002). After forward and backward translation, the questionnaire was sent to four academic experts knowledgeable in the area. Subsequently coordination and consensus of all experts' opinions, the final KAP Indonesian version questionnaire was drafted, and underwent pilot testing in 30 individuals to confirm the reliability. The overall of Cronbach's alpha of the KAP Indonesian version questionnaire was 0.87 in

our sample, indicating acceptable internal consistency (Taber, 2018).

The knowledge domain measured clinical presentations, transmission routes, prevention, and control of COVID-19. These questions were answered on a true/false and with an additional "I don't know" option. A correct answer was assigned 1 point and an incorrect/unknown answer was assigned 0 points. The total knowledge score was ranged from 0 to 12, with a higher score denoting a better knowledge of COVID-19. Attitudes domain was measured successfully controlled and confident against COVID-19. The practices domain was measured participants' behavior visit to public facilitations and wearing a mask when going out in recent days.

Ethical Clearance

After receiving approval from the Universitas Advent Indonesia of West Java of Indonesian Ethic Review Boards (No.100/KEPK-FIK.UNAI/EC/IX/20), the data collection was conducted. The eligible participants who agreed to participate were answered a yes or no question (as signed informed consent) and received assurance of confidentiality and privacy.

Statistical Analysis

SPSS series 17 was used to analyze the data. Knowledge, attitudes, and practices scores of different respondent according to demographic characteristics were compared with independent-samples *t* test, one-way analysis of variance (ANOVA), or Chi-square test. To identify factors associated with knowledge, attitudes, and practices against COVID-19, multivariable linear and logistic regression was used to analyze the demographic variables. Unstandardized regression coefficients (β), odds ratio (OR) and 95% confidence intervals (CI) was used to quantify the associations between variables and knowledge, attitude, and practices. The α-level at 0.05 was set, if ρ-value < 0.05 (two-sided) means statistically significant.

RESULTS

Characteristics, health's behavior, and diseases history of participants

A total of 492 nursing's students completed the survey questionnaires in the study. Among this final sample, the average age was 23.9 years (standard deviation [SD]: 6.22), 417 (84.4%) were women, and 351 (71.3%) held a bachelor's degree. The majority of the sample (n= 464; 94.3%) was never smoking. Of the participants, 303 were drank warm water everyday (61.6%), and 249 were exercise (50.6%). Most of respondents (n= 393; 79.9%) were no family history of diabetes, 489 (99.4%) never diagnosed diabetes and hypertension (n= 474; 96.3%) (Table 1).

Knowledge, Attitude and Practice of COVID-19

The mean COVID-19 knowledge score was 9.51 (SD = 1.45, range: 5–12), suggesting an overall 79.3% (9.51/12*100) correct rate on this knowledge test. The mean attitude score for COVID-19 was 2.05 (SD = 0.30, range: 2-4), indicating positive attitudes. The mean score for practices of COVID-19 was 2.19 (SD = 0.42, range: 2–4), indicating good practices.

Knowledge of the risks of COVID-19

Scores of knowledge about COVID-19 were significantly differed across genders, age, education levels, religion, exercise, and family history of diabetes mellitus (p<0.05) (Table 1). Table 1 demonstrates a score of knowledge in association with demographic variables. This study entered significant variables in linear regression analysis which shows the significant association between knowledge of nursing students after adjusting for gender and age, which means that those whose male (β: -0.889, p = 0.000) and older (β: 0.044, p = 0.000) had higher knowledge score about COVID-19 (Table 2).

Attitude

Almost all of the respondents believed that COVID-19 would be successfully controlled (94.1%). The nursing students' attitudes towards success in controlling COVID-19 were statistically significant differed in age, genders, and education levels (p<0.05) (table 3).

All variables were entered into linier regression analysis with a enter technique. In the final step, findings indicated that bachelor-nursing students were more likely to believe in successfully control COVID-19 than diploma (ß= -0.110, p = 0.008) (table 4).

The attitude towards confidence against COVID-19 was significantly differed in age (p =0.001), education levels (p = 0.040), and smoking behavior (p = 0.027) (table 3). Regarding the associated factors attitudes of confidence against COVID-19, education levels played significant effects to achieve confidence

Table 1. Knowledge scores with demographics characteristic, health behaviors and history among nursing students (n=492)

Demographic, behavior and Health History	N (%)	Mean (SD)	p-value
Age		9.51(1.45)	0.000
Gender			
Male	86 (17.5)	10.22 (1.51)	0.000
Female	406 (82.5)	9.35 (1.39)	
Education			
Diploma	141 (28.7)	9.82(1.56)	0.003
Bachelor	351 (71.3)	9.38(1.39)	
Religion			
Islam	171(34.8)	9.26(1.48)	0.000
Christen	117(23.8)	9.73(1.47)	
Catholic	103(20.9)	9.92(1.38)	
Hindu	98(19.9)	9.22(1.30)	
Buddha	3(0.6)	10.00(1.73)	
Smoking Habit			
Never	464(94.4)	9.48(1.41)	0.209
Smoking	14(2.8)	10.14(1.96)	
Drop	14(2.8)	9.71(1.98)	
Drink Warm Water			
Yes	303(50.6)	9.51(1.42)	0.865
No	189(38.4)	9.49(1.50)	
Exercise			
Yes	249(50.6)	9.38(1.42)	0.046
No	243(49.4)	9.64(1.47)	
Family history of DM			
Yes	99(20.1)	9.77(1.31)	0.044
No	393(79.9)	9.44(1.48)	
DM			
Yes	3(0.60)	10.67(1.16)	0.164
No	489(99.4)	9.50(1.45)	
Hypertension			
Yes	18(3.7)	9.78(1.67)	0.418
No	474(96.3)	9.50(1.44)	

Table 2. Multiple linear regressions on factors associated with good knowledge of COVID-19

Variables	ß	Standard Error	t	p-value
Gender	-0.889	0.186	-4.770	0.000
Age	0.044	0.012	3.817	0.000
Education	-0.006	0.158	-0.038	0.970
Religion	0.085	0.055	1.529	0.127
Smoking	-0.312	0.192	-1.625	0.105
Drink warm water	-0.019	0.131	-0.146	0.884
Exercise	0.189	0.129	1.464	0.144
Family history of DM	-0.249	0.159	-1.563	0.119
DM	-0.491	0.824	-0.596	0.552
Hypertension	0.135	0.346	0.390	0.697

Table 3. Attitudes towards COVID-19 by demographic variables

Demo-graphic Characteristics	Successfully controlled COVID-19		*p*-value	Confidence against COVID-19		*p*-value
	N (%)	Mean (SD)		N (%)	Mean (SD)	
Age		1.09 (0.362)	0.000		1.01 (0.090)	0.001
Gender			0.014			0.086
Male	86 (17.5)	1.13 (0.400)		86 (17.5)	1.02(0.152)	
Female	406 (82.5)	1.04 (0.278)		406 (82.5)	1.00 (0.070)	
Education			0.013			0.040
Diploma	141 (28.7)	1.15 (0.430)		141 (28.7)	1.02 (0.145)	
Bachelor	351 (71.3)	1.06 (0.328)		351 (71.3)	1.00 (0.053)	
Religion			0.944			0.890
Islam	171 (34.8)	1.09 (0.409)		171 (34.8)	1.01 (0.108)	
Christen	117 (23.8)	1.09 (0.347)		117 (23.8)	1.01 (0.092)	
Catholic	103 (20.9)	1.09 (0.346)		103 (20.9)	1.01 (0.099)	
Hindu	98 (19.9)	1.06 (0.315)		98 (19.9)	1.00 (0.000)	
Buddha	3 (0.6)	1.00 (0.000)		3 (0.6)	1.00 (0.000)	
Smoking Habit			0.828			0.027
Never	464 (94.4)	1.08 (0.365)		464 (94.4)	1.01 (0.080)	
Smoking	14 (2.8)	1.07 (0.267)		14 (2.8)	1.00 (0.000)	
Drop	14 (2.8)	1.14 (0.363)		14 (2.8)	1.07 (0.267)	
Drink Warm Water			0.323			0.581
Yes	303 (50.6)	1.07 (0.328)		303 (50.6)	1.01 (0.099)	
No	189 (38.4)	1.11(0.412)		189 (38.4)	1.01 (0.073)	
Exercise			0.755			0.981
Yes	249 (50.6)	1.08 (0.350)		249 (50.6)	1.01 (0.089)	
No	243 (49.4)	1.09 (0.375)		243 (49.4)	1.01 (0.091)	
Family history of DM			0.889			0.807
Yes	99 (20.1)	1.08 (0.340)		99 (20.1)	1.01 (0.101)	
No	393 (79.9)	1.09 (0.368)		393 (79.9)	1.01 (0.087)	
DM			0.235			0.875
Yes	3 (0.60)	1.33 (0.577)		3 (0.60)	1.00 (0.000)	
No	489 (99.4)	1.08 (0.361)		489 (99.4)	1.01 (0.090)	
Hypertension			0.722			0.696
Yes	18 (3.7)	1.06 (0.236)		18 (3.7)	1.00 (0.000)	
No	474 (96.3)	1.09 (0.366)		474 (96.3)	1.01 (0.092)	

against COVID-19 for nursing students (ß= -0.022, p = 0.029) (table 4).

Practices Toward COVID-19

The vast majority of the participants had not visited any crowded place (96.4%) and wore masks when going out (98.0%) in recent days. There was still a small portion of the participants who had visited crowded places (3.6%) and had not worn masks when leaving home (2.0%) recently. The practices to against COVID-19 of nursing students (visit in crowded public facility) were significantly different in age (p = 0.001), gender (p = 0.020), religion (p = 0.000), smoking habit (p = 0.049), exercise (p = 0.000), and family history of DM (p = 0.018(table 5). The practice in wearing mask at home was significantly different among age (p = 0.009), gender (p = 0.000), education (p = 0.043), religion (p = 0.003), smoking habit (p = 0.018), and exercise (p = 0.002) (table 5).

The results of the multiple regression models are reported in Table 6, which provides standardized beta coefficients and significance levels. The demographic model found that visit to crowded public facility were associated with age (OR = 0.95, 95% CI = 0.91-0.99, p= 0.014), gender (OR = 0.36, 95% CI = 0.14-0.90, p = 0.028), religion (OR = 1.39, 95% CI = 1.10-1.74, p = 0.005), exercise (OR = 0.37, 95% CI

Table 4. Multiple linear regressions on factors associated with attitudes towards COVID-19

Variables	ß	Standard Error	t	*p*-value
Successfully controlled COVID-19				
Gender	-0.046	0.049	-0.936	0.350
Age	-0.005	0.003	-1.636	0.103
Education	-0.110	0.041	-2.663	0.008
Religion	-0.007	0.014	-0.487	0.627
Smoking	0.002	0.050	0.044	0.965
Drink warm water	0.023	0.034	0.678	0.498
Exercise	-0.001	0.034	-0.038	0.970
Family history of DM	0.018	0.042	0.441	0.660
DM	-0.206	0.215	-0.955	0.340
Hypertension	0.035	0.090	0.393	0.694
Confidence against COVID-19				
Gender	-0.006	0.012	-0.476	0.635
Age	-0.001	0.001	-1.158	0.247
Education	-0.022	0.010	-2.191	0.029
Religion	-0.002	0.004	-0.512	0.609
Smoking	0.024	0.012	1.897	0.058
Drink warm water	-0.005	0.009	-0.580	0.562
Exercise	-0.002	0.008	-0.914	0.846
Family history of DM	0.005	0.010	0.002	0.998
DM	0.027	0.053	0.504	0.614
Hypertension	0.014	0.022	0.632	0.528

Table 5. Practices towards COVID-19 by demographic variables

Demographic Characteristics	Visited to crowded public facility (n [%] or Mean [SD])		*p*-value	Wearing mask at home (n [%] or Mean [SD])		*p*-value
	Yes	No		Yes	No	
Age	1.82 (0.39)		0.001	1.08 (0.274)		0.009
Gender			0.020			0.000
Male	8 (9.3)	78 (90.7)		66 (76.7)	20(23.3)	
Female	81 (20.0)	325(80.0)		386 (95.1)	20 (4.9)	
Education			0.518			0.043
Diploma	28 (19.9)	113 (80.1)		124 (87.9)	17 (12.1)	
Bachelor	61 (17.4)	290 (82.6)		328 (93.4)	23 (6.6)	
Religion			0.000			0.003
Islam	33 (19.3)	138 (80.7)		162 (94.7)	9 (5.3)	
Christen	31 (26.5)	86 (73.5)		99 (84.6)	18(15.4)	
Catholic	23 (22.3)	80 (77.7)		92 (89.3)	11(10.7)	
Hindu	2(2.0)	96 (98.0)		96 (98.0)	2 (2.0)	
Buddha	0 (0.0)	3 (100)		3 (100)	0 (0.0)	
Smoking Habit			0.049			0.018
Never	84 (18.1)	380(81.9)		429 (92.5)	35 (7.5)	
Smoking	5 (35.7)	9 (64.3)		10 (71.4)	4 (28.6)	
Drop	0 (0.0)	14 (100)		13 (92.9)	1 (7.1)	
Drink Warm Water			0.443			0.830
Yes	58 (19.1)	145 (80.9)		279 (92.1)	24 (7.9)	
No	31 (16.4)	158 (83.6)		173 (91.5)	16 (8.5)	
Exercise			0.000			0.002
Yes	27 (10.8)	222 (89.2)		238 (95.6)	11 (4.4)	
No	62 (25.5)	181 (74.5)		214 (88.1)	29 (11.9)	
Family history of DM			0.018			0.666
Yes	26 (26.3)	73 (73.7)		92 (92.9)	7 (7.1)	
No	63 (71.7)	330 (84.0)		360 (91.6)	33 (8.4)	
DM			0.491			0.109
Yes	1 (33.3)	2 (66.7)		2 (66.7)	1 (33.3)	
No	88 (18.0)	401 (82.0)		450 (92.0)	39 (8.0)	
Hypertension			0.433			0.684
Yes	2 (11.1)	16 (88.9)		17 (94.4)	1 (5.6)	
No	87 (18.4)	387 (81.6)		435 (91.8)	39 (8.2)	

Table 6. Multiple linear regressions on factors associated with practices towards COVID-19

Variables	ß	Standard Error	OR(CI 95%)	*p*-value
Visit to crowded public facility				
Gender	-1.026	0.467	0.36 (0.14-0.90)	0.028
Age	-0.052	0.021	0.95 (0.91-0.99)	0.014
Education	-0.304	0.322	0.74 (0.39-1.39)	0.345
Religion	0.326	0.117	1.39 (1.10-1.74)	0.005
Smoking	0.193	0.467	1.21 (0.48-3.03)	0.680
Drink warm water	0.154	0.265	1.17 (0.69-1.96)	0.560
Exercise	-0.984	0.268	0.37 (0.22-0.63)	0.000
Family history of DM	0.578	0.292	1.78 (1.01-3.16)	0.048
DM	0.838	1.306	2.31 (0.18-2.90)	0.521
Hypertension	-1.154	0.839	2.56 (1.25-5.24)	0.010
Wearing mask at home				
Gender	-1.923	0.392	0.15 (0.07-0.32)	0.000
Age	0.030	0.027	1.03 (0.98-1.08)	0.273
Education	0.031	0.427	1.03 (0.45-2.38)	0.942
Religion	-0.025	0.175	0.98 (0.69-1.37)	0.884
Smoking	-0.472	0.435	0.62 (0.27-1.46)	0.278
Drink warm water	-0.126	0.375	0.88 (0.42-1.84)	0.737
Exercise	1.085	0.399	2.96 (1.35-6.47)	0.007
Family history of DM	0.384	0.488	1.47 (0.56-3.82)	0.431
DM	-1.121	1.486	0.33 (0.02-6.00)	0.451
Hypertension	1.087	1.178	2.97 (0.30-9.85)	0.356

diabetes mellitus (OR = 1.78, 95% CI = 1.01-3.16, p = 0.048), and had hypertension (OR = 2.56, 95% CI = 1.25-5.24, p = 0.010).

DISCUSSIONS

The current study assessed the knowledge, attitudes, and practices against COVID-19 of nursing students in Indonesia. Participants were found to have good levels of knowledge regarding COVID-19 as well as positive attitudes and practices toward the COVID-19. Health behavior and diseases histories were also detected among participants. Additional, the findings found a significant number of socio-demographic factors that affect KAP

The average knowledge of COVID-19 score of Indonesian nursing students was moderate at 9.51 ±1.45 with an overall correct rate of 79.3%. The correct percentages of COVID-19 knowledge widely ranged that indicated some participants had high levels of knowledge on COVID-19, others did not. Indonesian nursing students who were 23.9 years and above held higher knowledge scores. The possible reasons due to a higher risk perception of contraction and complications from the disease (Cao *et al.*, 2020). On the other hand, female nursing students were scored lowest knowledge than male. This may indicate limited time and access to credible and timely information about the virus. This variation in levels of knowledge may be reflective of the current COVID-19 information landscape among nursing students in Indonesia.

Although health authorities have been consistently disseminating COVID-19 information since the disease was first detected in Indonesia, there has also been a surge in false and inaccurate information. The overload of information may have caused confusion and difficulty ascertaining correct information. Previous studies reported that high levels of COVID-19 knowledge among the general population (Zhong *et al.*, 2020), and healthcare workers (Huynh *et al.*, 2020). The reasons due to differences in measurement and scoring systems do not make it possible for accurate comparisons of knowledge levels across these studies.

Concerning attitudes, nursing students showed a positive and optimistic attitude toward overcoming COVID-19. Approximately nine out of ten nursing students were confident and believe that Indonesia would be able to success control the COVID-19. High levels of positive attitudes were also detected in the KAP study conducted in China

(Zhong *et al.*, 2020), Iran, (Taghrir, Borazjani and Shiraly, 2020), Jordan (Alzoubi *et al.*, 2020) and Arab Saudi (Alfahan *et al.*, 2016). Those studies attributed the positive attitudes to the drastic measures taken by government in mitigating the spread of the COVID-19.

Positive attitudes and high confidence in the control of COVID-19 can be explained by the government's unprecedented actions and prompt response in taking stringent control and precautionary measures against COVID-19, to safeguard citizens and ensure their well-being. These measures include the lockdown, and the suspension of all domestic and international flights, prayer at mosques, schools and universities, and the national curfew imposed on citizens. This finding is consistent with a recent study conducted in China, where the majority of participants were convinced that the disease is curable and that their country will combat the disease (Bhagavathula *et al.*, 2020).

Our findings reinforce conclusions from previous studies associating higher levels of knowledge with higher confidence and positive attitudes in health crises (Shi *et al.*, 2020). In Indonesia; the swift action was taken by the Indonesian government in enforcing these positive attitudes.

Positive attitudes were higher among those bachelor-nursing students. This population showed the highest confidence that COVID-19 would be successfully controlled, and Indonesia would be succeed fight against COVID-19. The Indonesia government were managing and handling the health crisis well.

Current study found that most of nursing students reported taking precautions such as avoiding crowded places and practicing proper hand hygiene during pandemic and new normal period. This indicates a general willingness for participants to make behavioral changes in the face of the COVID-19 pandemic. Interestingly, nursing students were garnered a diverse response about wearing of face masks at home. One out of ten nursing students indicated that they did not wear a facemask when leaving the home. Although, the number of participants is only a few who do not use a mask when at home but it is a crucial issue related to nursing students' habit. The possible explanations, Indonesian society have not habit wear masks at home or out door. It is uncommon for the typical Indonesian to wear a face mask when ill. The emergence of COVID- 19 caused an increase in demand for medical facemasks and hand sanitizer in the country and supplies were short (Harun, Yusof and Solhi, 2020). The scarcity of face masks meant that many regular members of the public were unable to obtain them. The shortage of personal protective equipment was not limited to Indonesia. It had become a global problem due to increased demand in response to COVID-19 (Organization, 2020). The other explanation due to the Ministry of Health Indonesia has been establish that medical face masks should only be worn by those who are showing symptoms of COVID-19 and health care providers. This was to ensure sufficient supplies of personal protective equipment for health care providers on the frontline. The lack of supply personal protective equipment especially face masks may cause by the mixed messages led to the divided response on the wearing of face masks when out in public.

Finally, the study findings may be useful to inform policymakers and healthcare professionals, on further public health interventions, awareness-raising, policies, and health education programs. The COVID-19 pandemic has been a teething public health problem around the world. Nursing students have important role to manage and handle COVID-19. Nursing students should have good knowledge, attitudes and practices on COVID-19 to design cost-effective public health campaigns and education programmes for society. The current study the need for more comprehensive education programmes with focus on consistency of information from the government and related authorities. COVID-19 education efforts should take a proactive approach and focus on dispelling misinformation in the form of conflicting opinions, old wives' tales and incorrect information.

CONCLUSION

In summary, our findings indicate that during the rapid rise period of the COVID-19 pandemic, Indonesian nursing students demonstrated substantial differences in knowledge, attitudes, and practices of toward COVID-19. The findings suggest that Indonesian nursing students have good level of knowledge on COVID-19 and are generally

positive in their outlook on overcoming the pandemic, thereby leading to more favorable attitudes and to implementation and maintenance of safe practices.

Nursing students should also be properly guided to proper sources of information during these times. When push comes to shove, nursing students should also be equipped with medical knowledge, proper attitude, and good precautionary measures. Given current global situation, more frequent utilization of social media by nursing schools to spread knowledge become a necessity and plans should be placed to implement such dissemination in early stages of medical and public health emergencies.

Limitations

Sampling for the study was conducted via a convenience sample through the networks of the researchers and disseminated through different social media platforms (WhatsApp, Facebook, and Line). As a result, there is a possibility of bias as underprivileged populations may not have been able to participate in the study. Additionally, when compared to current nursing students' population statistics in Indonesia, the sample of the study was over-representative.

Therefore, there are limitations to the representativeness of the findings. Recent study was conducted using a cross-sectional study design. Consequently, causal inferences may not be founded. Our study used an online-based survey approach to avoid possible transmission of COVID-19, such that the cohort reflects sampling biases by being conducted online, thereby restricted to only those with Internet access, and consequently unlikely to represent an accurate reflection of the whole Indonesia nursing-students population.

A more systematic, inclusive sampling method is warranted to improve representativeness and generalizability of the findings. A further limitation of the present study is the possibility of participants giving socially desirable responses. As this study used self-reported data, it is possible that participants may have answered attitude and practice questions positively based on what they perceive to be expected of them (Van de Mortel, 2008).

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Conflict of Interest

The Authors declare that there is no conflict of interest.

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