Original article: Nursing students' population

COVID-19 infection: comparing the knowledge, attitude and practices in a sample of nursing students

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Abstract. *Background:* SARS-CoV-2 infection is a global health problem that is primarily detected in Italy with progressive increase in cases and deaths. To facilitate the management of the pandemic in Italy, it is essential to understand the level of attention on COVID-19. The aim of the study was to evaluate the knowledge, attitude and practices towards SARS-CoV-2 among the nursing students of University of Palermo during the rapid rise period of the COVID-19 pandemic. *Methods:* The current study was a cross-sectional study. On-line questionnaires were used for the collection of the data by providing a survey in all nursing students. The questionnaire consisted of two parts: demographics and Knowledge, Attitude and Practices (KAP) survey. A multivariate linear regression model was used and adjusted Odds Ratios (aOR) are presented. *Results:* 525 students were interviewed and their mean age was 21.8. The overall score indicates good practices among the three courses of study (p=0.025). The Multivariable logistic regression showed that the dependent variable "Practice poor score" is statistically significant associated with these independent variables: "Other country of birth" (aOR 17.7, 95% CI 2.31-136.03), "second" (aOR 2.65, 95% CI 1.21-7.80) and "third" (aOR 2.96, 95% CI 1.31-6.72) year of study, "low perceived health status"(aOR 2.35, 95% CI 1.04-5.30) and "Knowledge poor score (aOR 3.05, 95% CI 1.06-8.77). *Conclusion:* Our results suggest that health education programs aimed at improving COVID-19 knowledge are helpful for nursing students to hold optimistic attitudes and maintain appropriate practices. (www.actabiomedica.it)

Key words: Knowledge, Attitude, Practice, COVID-19, Italy, University students

Introduction

The outbreak of new pathogens that cause lethal human respiratory diseases with pandemic potential poses major challenges and quickly focus the attention of global public health authorities (1). Until a few months ago, two zoonotic coronaviruses, SARS-CoV and MERS-CoV, cause of respiratory tract infections in humans and with pandemic potential, appeared in the WHO Blueprint of priority pathogens for research and development. The first case of coronavirus due to Severe Acute Respiratory Syndrome (SARS) was first identified in the Chinese province of Guangdong in 2002-2003 and a second coronavirus is the one that caused Middle East Respiratory Syndrome (MERS) in 2012 (2-4). At the end of 2019, a new zoonotic coronavirus, SARS-CoV-2, was first reported in Wuhan, China, and was included on the WHO priority Blueprint list. The disease caused by SARS-CoV-2, abbreviated as COVID-19 (COrona-VIrus Disease-2019),

is widespread within China at an alarming rate and in the following weeks has spread all over the world, so that, on 11 March 2020 the WHO declared the outbreak a pandemic (5). The rapid spread that occurred in China, despite a "lock" of Wuhan through the suspension of public transport, the closure of public spaces, the close management of communities and isolation, has led to numerous chains of transmission and spread of the virus that was facilitated by the rush to travel nationally and internationally during the New Year holidays, which saw hundreds of thousands of people leave the city and carry the virus (6). The world has become increasingly susceptible to the advent of new infectious diseases that can spread rapidly due to the ease with which you move within regions and continents. To date, the virus has more than 3 million cases and about 220,000 deaths. In Italy alone, the total registered cases of the pandemic are more than 209,000, with a death toll of almost 29,000, in second place among the top 5 countries for local transmission in Europe (7). Numerous investigations and research into the COVID-19 epidemic quickly defined the epidemiological, virological and clinical characteristics, and provided evidence of human transmission in community, home and hospital settings (8). The time from exposure to the virus until the symptoms is between 2 and 14 days. As with SARS and MERS, the reported data present a series of clinical manifestations, from asymptomatic subclinical infection or mild respiratory tract disease and severe pneumonia that progresses to acute respiratory distress syndrome (ARDS) with need of intensive care, and even lead to death. While the world is waiting for the development of an effective vaccine and specific drugs for the treatment of people affected by SARS-CoV-2, the most important weapon available to minimize the risk of spreading the virus, is the respect of adequate preventive measures. Social distancing, the correct use of masks, the frequent washing of hands, avoiding touching the nose, mouth and eyes with dirty hands, are fundamental preventive measures to limit the spread of the virus in the general population, while the correct use of adequate PPE protects Health-Care Workers (HCWs) and, consequently, patients. Of course, the main goal is to minimize the risk of virus circulation and spread nationally and internationally and to identify and iso-

late infected patients quickly and safely. Aggressive isolation measures in China have led to a progressive reduction in cases. In Italy, the political and health authorities have paid the utmost attention to measures to contain the contagion throughout the national territory in order to face an emergency that is severely testing the health system. To date, one of the main objectives is to sensitize and educate the population on preventive measures to reduce infections, evaluating Knowledge, Attitudes and Practices at this critical moment. To facilitate the management of the epidemic in Italy, it is essential to understand the level of attention on COVID-19 also by HCWs, at high risk of infection or becoming vehicles of the virus, in order to improve their knowledge and attitudes towards of the infection that will inevitably be reflected in general health.

Aim

The aim of the study was to evaluate the knowledge, attitude and practices towards SARS-CoV-2 among the nursing students of University of Palermo during the rapid rise period of the COVID-19 pandemic.

Materials and methods

Study design

This cross-sectional survey was conducted on March 2020 the week immediately after the lockdown of Italy. A survey was provided to all nursing students of University of Palermo of the three years of course, accompanied by informed consent. Nursing students who understood the aims of the study, and agreed to participate in the study were instructed to complete the on-line questionnaire via clicking a special link. Because it was not feasible to do a community-based national sampling survey during the lockdown, we decided to collect the data online during the lessons, students completed the questionnaire during the lesson, within the 20-minute interval allowed for the break during the lesson.

Instrument

The questionnaire consisted of two parts: demographics and Knowledge, Attitude and Practices (KAP) survey. In the first section of the questionnaire, personal information was requested, relating to the course of study undertaken, the perception of the economic and health status and voluptuary habits. According to guidelines for clinical and community management of COVID-19 by the Ministry of Health of Italy (9), a KAP Survey (see Table 1) was designed and modified from previously published research articles (10,11). It consists of mainly three sections: Knowledge of nursing students towards COVID-19 in which the options "Yes" or "No" against each set of 13 questions were evaluated; Attitude of nursing students towards COVID-19 in which five options "Strongly agree (SA)", "Agree (A)", "Undecided (U)", "Disagree (D)", "Strongly disagree (SD)" against each set of 7 questions were used; and Practice of nursing students towards COVID-19 in which the options "Yes", "No" or "Sometimes" against each set of 8 questions were evaluated. Three scores can be obtained from the KAP Survey respectively. Knowledge score was assessed by giving 1 to correct answer and 0 to wrong answer. The scale measured knowledge of maximum 13 to minimum 0. Score of < 9 were taken as poor while ≥ 9 as good. Assessment of attitude was carried out through item questions in which the responses were recorded on 5 point likert scale: a score of 1 was given to "SA", 2 to "A", 3 to "U", 4 to "D" and 5 to "SD". A mean score of ≤2 was considered as positive attitude while score of 3-5 was taken as negative attitude. Questions of practices have an overall practice score that ranged from 0 to 8. From the "yes" option was given a score of 1, from the other options ("no" or "Sometimes") it was given a null score. Finally practice scores were dichotomized to good practice (1 point) with score ≥ 6 or poor practice (0 point) with score < 6.

Data Analysis

For all qualitative variables absolute and relative frequencies have been calculated; categorical variables were analyzed by Pearson's Chi-square test (χ^2). A multivariable logistic regression was performed, considering it as a dependent variable "practice poor score", in order to evaluate the role of the variables in the first section of the questionnaire. The statistical significance level chosen for all analyzes was 0.05. The results were analyzed using the STATA statistical software version 14 (12). Results are expressed as adjusted Odds Ratio (aOR) with 95% Confidence Intervals (95% CI).

Ethical approval was given by the local Ethical Committee of the University Hospital Paolo Giaccone of Palermo, No. 03/2020 (13. Studio Sars-CoV 2 - KAP Survey Student) of March 16, 2020.

Results

A total of 525 nursing students were included (response rate of 99.3%). The study showed that the mostly participants were female (70.3%) and the mean age was 21.8 (Standard Deviation ± 3.83). 37.5% of participants reported attending the first year of study, 35.3% second year of study, 27.2% third year of study 19.2% reported a low economic status whilst 8.57% reported a low perceived health status. A total of 501 (95.4%) respondents showed good knowledge while 24 (4.6%) of nursing students had poor knowledge of SARS CoV-2. Of 525 respondents, 478 (91.1%) showed positive attitude while 47 (8.9%) participants displayed negative attitude about SARS CoV-2. The majority of the studied sample (89.3%) reported good practice and 10.7% reported poor practice. For more details see Table 2 that shows the demographic characteristics of the participants. Table 3 shows bivariate associations between knowledge, attitude, practice score and years of university course attended. The overall score indicates good practices among first year (93.9%), second year (87.6%), third year (85.3%) showed statistically significant (p=0.025). No statistically significant results were showed for the overall score of knowledge and attitudes. Finally, Table 4 shows the aOR, each independent variable is adjusted for all the other independent variables. Considering the dependent variable: "Practice poor score" the statistically significant independent variables associated are: "Other country of birth" (aOR 17.7, 95% CI 2.31-136.03), "second" (aOR 2.65, 95% CI 1.21-7.80) and "third" (aOR 2.96, 95% CI 1.31-6.72) year of study, "low perceived health status"(aOR 2.35, 95% CI 1.04-5.30) and "Knowledge poor score (aOR 3.05, 95% CI 1.06-8.77).

Table 1. KAP Survey towards COVID-19

Questions
K1. SARS CoV-2 is caused by beta-coronavirus
K2. SARS CoV-2 patients develop severe acute respiratory illness
K3. Fever, cough and shortness of breath are hallmark symptoms of SARS CoV-2
K4. People with co-morbidity (Diabetes, cancer and other chronic diseases) are more likely to be infected
K5. Incubation time for virus is 14-28 days
K6. SARS CoV-2 spreads with greater probability following close contact with infected people
K7. The main source of SARS CoV-2 is plant
K8. Washing hand with soap and water for at least 30 secs can help in prevention of transmission of disease
K9. Vaccination of SARS CoV-2 is available in market
K10. Polymerase Chain Reaction (PCR) can used to diagnose SARS CoV-2
K11. Special attention must be paid if a person has characteristic symptoms after staying in major areas contagion risk
K12. Antibiotics are first line treatment
K13. SARS CoV-2 can be fatal
A1. Transmission of SARS CoV-2 infection can be prevented by using universal precautions given by CDC, WHO
A2. Prevalence of SARS CoV-2 can be reduced by active participation of HCWs in hospital infection control program
A3. Any related information about SARS CoV-2 should be disseminated among peers and other HCWs
A4. SARS CoV-2 patients should be kept in isolation
A5. Intensive and emergency treatment should be given to diagnosed patients
A6. HCWs must acknowledge themselves with all the information about SARS CoV-2
A7. Gowns, gloves, mask and googles must be used when dealing with SARS CoV-2 patients
P1. Use soap and water to wash my hands continuously
P2. Cover my nose and mouth with a tissue during sneezing or coughing
P3. Throw the used tissue in the trash
P4. Avoid touching my eyes, nose or mouth as far as I can
P5. Use face mask in crowds
P6. Carefully handle suspected patient's belongings
P7. Keep on healthy eating and health styles
P8. Used to educate clients about the disease

Discussion

Today the COVID-19 pandemic, mediated by the SARS-CoV-2 virus, is a topic of daily debate particularly on social media and involves, in times of public health crisis, directly the health systems, all Health Care Workers (HCWs) but also the patients. Among the strengths of our study is the involvement of future HCWs and the association between their knowledge in relation to SARS-CoV-2 with practice. Among the students of the degree course in nursing at the University of Palermo, there is a good general knowledge of SARS-CoV-2, according to what emerges from the literature regarding medical students (13), given the absence of data for studies on nursing students. The most interesting results of our study emerge from multivariable logistic regression, in which each independent variable is adjusted for all other independent variables, with the aOR results shown in Table 4. The dependent variable "Poor Knowledge Score" is asso-

Table 2. Description of the sample

		N	%
Gender	Male	156	29.71
	Female	369	70.29
Country of birth	Italy	520	99.05
	Other	5	0.95
Year of study	First	197	37.52
	Second	185	35.24
	Third	143	27.24
Perceived economic status	Medium-high	424	80.76
	Low	101	19.24
Perceived health status	Medium-high	480	91.43
	Low	45	8.57
Knowledge score	Good	501	95.43
	Poor	24	4.57
Attitude score	Positive	478	91.05
	Negative	47	8.95
Practice score	Good	469	89.33
	Poor	56	10.67
Age	21.83 (SD ± 3.83)*		

*mean (Standard Deviation)

Table 3. Mean score of knowledge, attitude and Practices of nursing students about SARS CoV-2

	Knowledge			**Attitude**			**Practices**		
	Good N (%)	Poor N (%)	p-value	Positive N (%)	Negative N (%)	p-value	Good N (%)	Poor N (%)	p-value
First year	188 (95.43)	9 (4.57)		175 (88.83)	22 (11.17)		185 (93.91)	12 (6.09)	
Second year	177 (95.68)	8 (4.32)	0.970	168 (90.81)	17 (9.19)	0.204	162 (87.57)	23 (12.43)	0.025
Third year	136 (95.10)	7 (4.90)		135 (94.41)	8 (5.59)		122 (85.31)	21 (14.69)	

Used Pearson chi-square test

ciated in a statistically significant way (p <0.05) with several independent variables, which, for convenience and clarity, we analyze individually below. The independent variable "Country of birth: Other" (aOR 17.73, IC 2.31-136.03) despite having a p value = 0.006, a value that is statistically very significant in itself, is simultaneously associated with a decidedly large IC, so despite the significance of the p value, the data

loses consistency when the IC is taken into consideration. The independent variables "Year of study: Second - Third" (Second: aOR 2.65, IC 1.21-7.80, Third: aOR 2.96 IC 1.31-6.72) present in both cases statistically significant p values (p = 0.015 and p = 0.009), joining a "Poor Knowdledge Score". This observation is apparently a contradiction. Proceeding with the studies should give the student more and more knowledge,

Table 4. Multivariable logistic regression. Adjusted Odds Ratio are presented. Each independent variable is adjusted for all the other independent variables. Based on 525 observations

Independent variables		Dependent variable: "practice poor score"		
		aOR	95% CI	p-value
Gender	Male	1		
	Female	1.27	0.66-2.47	0.471
Country of birth	Italy	1		
	Other	17.73	2.31-136.03	0.006
Year of study	First	1		
	Second	2.65	1.21-7.80	0.015
	Third	2.96	1.31-6.72	0.009
Perceived economic status	Medium-high	1		
	Low	1.23	0.62-2.45	0.559
Perceived health status	Medium-high	1		
	Low	2.35	1.04-5.30	0.039
KAP Attitude	Positive	1		
	Negative	1.24	0.47-3.29	0.663
KAP Knowledge	Good	1		
	Poor	3.05	1.06-8.77	0.038
Age	As the unit increase	0.98	0.66-2.47	0.471

instead we observe exactly the opposite phenomenon, and we do not find anything similar in literature. This is probably a limitation of our study, which will have to be re-evaluated following specific training for COVID-19 aimed at students of the nursing degree course. The purpose of the specific training is to understand if these gaps are linked to objective deficiencies in the content of the course of study or to a methodological error in our study.

The independent variable "Perceived health status: Low" (aOR 2.35, IC 1.04-5.30) has a value of p = 0.039, therefore statistically significant. Students who perceive a poor state of health are likely to document more than those who perceive a good state of health, and this type of approach ends in a period, such as the one we are experiencing, in which we face the pandemic caused by SARS -CoV-2 and the sources of information are varied. A good method to avoid information overload for health professionals who are on the front line for which the influx of new information

is extremely rapid and from multiple sources, could be the creation of short summary documents with the most up-to-date information, allowing healthcare workers to read up quickly, avoiding the stress of having to draw from multiple sources (14). The independent variable "KAP Knowledge: Poor" (aOR 3.05, IC 1.06-8.77) has a value of p = 0.038, therefore statistically significant, in relation to the dependent variable "Practice poor score" according to what emerges in the literature (15). This observation is extremely important as it associates the knowledge of SARS-CoV-2, and therefore the "Knowledge" Score, to the Practice. The results of our KAP survey on the students of the degree course in Nursing at the University of Palermo highlight the importance and the need to improve some aspects of the knowledge of SARS-CoV-2, which, consequently, can also lead to improvements in their practices (16). HCWs, today more than ever, play a fundamental role in the contrast of SARS-CoV-2, both as regards the therapeutic and preventive as-

pects, so it is of fundamental importance that the basic knowledge is solid in order to decrease the risk of work infection and maximize the effectiveness of preventive measures, the only real weapons available in the absence of both an approved SARS-CoV-2 vaccine and specific therapy (17).

Conclusions

In summary, our findings suggest that nursing students of the University of Palermo have had a good level of knowledge, optimistic attitudes, and appropriate practices towards COVID-19 during the rapid rise period of the COVID-19 outbreak. In reality, the study shows a deterioration of knowledge as students progressed through their program; nevertheless, students reported adequate practice and positive attitudes about the infection. Limit of our study or not, this result indicates that health education programs aimed at improving COVID-19 knowledge are helpful for encouraging an optimistic attitude and maintaining safe practices, demonstrating that surveillance and infection control measures are basic for global public health, especially in nurses or other HCWs category. However, the global pandemic opened up opportunities to the country to upgrade its educational mode of delivery and transfer its attention to emerging technologies. Higher education institutions thereby need to seize the opportunity to strengthen its evidence-based practices, provide accessible mental health-related services, and make the curriculum responsive to the needs of the changing times. Therefore, health care workers' knowledge, attitude and practice play a major role in the prevention and restrain in complications of SARS-CoV-2 infection, in accordance with KAP theory.

Ethical approval: This study was approved by the Ethical Committee of the University Hospital "P. Giaccone" of Palermo, Minutes No. 03/2020 (13) of March 16, 2020.

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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