RESEARCH PAPER

# Knowledge, attitudes and practices towards COVID-19 among nursing students of the University of Palermo: results from an online survey

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## Summary

**Introduction**. *The aim of the study was to evaluate the knowledge, attitude and practices towards SARS-CoV-2 among nursing students of University of Palermo during the rapid rise period of the COVID-19 pandemic.*
**Materials and methods**. *This is cross-sectional study. A survey was provided to all nursing students and 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**. *575 students were interviewed, and their mean age*

*was 22.29 ± 4.2. The overall score indicates good knowledge (p=0.046) and good practices among the four courses of study (p=0.038). Multivariate linear regression showed that Attitude score (β = -0.29; p = 0.024) and Knowledge score (β = 0.10; p = 0.026) adjusted for age, gender, year of study, perceived economic status, perceived health status were significantly associated with Practice score.*
**Conclusion**. *Our results suggest that proper health education is useful for encouraging optimistic attitudes and maintaining safe practices among future category of nurses.*

## Introduction

Coronaviruses (CoVs) are a large family of viruses that circulate worldwide having an extensive range of natural hosts. This family includes common human CoVs, that usually cause mild to moderate upper respiratory tract illnesses, and other human coronaviruses (SARS-CoV, MERS-CoV), that can cause serious infections of the lower respiratory tract, especially in infants, the elderly and immunocompromised individuals [1]. SARS-CoV-2 is a new strain of coronavirus that was never identified in humans before being reported in Wuhan, China in December 2019. On 31th December 2019, a cluster of 27 patients with pneumonia of unknown etiology was reported to local Chinese healthcare authorities in Wuhan City. The Chinese authorities reported that the cause of the outbreak was a novel Coronavirus named "2019-nCoV" [2], which was subsequently named SARS-CoV-2 (Severe Acute Respiratory Syndrome CoronaVirus 2). The name was chosen based on genetic similarity to the virus responsible for the SARS epidemic in 2002-2003. So, SARS-CoV-2 is responsible for a disease defined COVID-19 (COronaVIrus Disease-19) [3].
People infected with COVID-19 may have few or no symptoms, although some become seriously ill and die.

Symptoms may include fever, general fatigue, myalgia, nasal congestion, dry cough and dyspnea. Those with more severe disease may have remains of lymphopenia and imaging of the chest compatible with pneumonia, as well as severe acute respiratory syndrome, a kidney failure, and even begin to death [4]. In the following weeks, there was an exponential increase in new cases and deaths from COVID-19; then the epidemic spread all over the world, therefore on 11 March 2020 the World Health Organization (WHO) declared the epidemic a pandemic [5]. This new virus has the potential to transmit from person to person, especially in healthcare settings. The exact incubation time is uncertain; estimates vary from 1 to 14 days. Initial estimates of the mortality rate from China (2.3% in the largest series of cases) indicate that it appears to be less severe compared to SARS (10%) or MERS (35%); mortality increases with age [6]. SARS-CoV-2 infection is a highly contagious disease, the current base reproductive rate (R0) of COVID-19 (2-2.5) is still controversial. It is probably slightly higher than SARS R0 (1.7-1.9) and higher than MERS (< 1) [7] with variable case fatality rate that increase for subjects aged 60 or older and in those with comorbidities [8] the Italian national health system has prepared itself for admission of additional critically ill patients as a matter of emergency. Therefore, COVID-19 has proposed a new challenge for healthcare workers (HCWs) and as a

response to the pandemic, Italian Ministry of Health had appointed several designated hospitals for patients with SARS-CoV-2 infection. These emergency situations certainly require the formation of multidisciplinary teams in hospitals to enable to provide the maximum level of care to critically ill while ensuring the protection of HCWs. However, the occurrence of asymptomatic and subclinical SARS-CoV-2 in community or in healthcare settings could be a huge threat to public health. In view of this, HCWs are at great risk of acquiring this infection or become a source of transmission for patients and their colleagues [9]. In this contest, the access to personal protective equipment (PPE) for HCWs is crucial so that containment measures can reduce the rate of infection [10]. The presence of this fatal virus among HCWs brings into light the urgent need of developing a thorough awareness program by initiating infection control measures to cut down the prevalence rate of this rapid disease. As a result, efforts must focus on the prevention of the disease as well as limiting the complications of existing cases. Therefore, HCWs 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 [11, 12]. The knowledge, attitude and practices (KAP) model is one of the most used models in the medical field; the KAP model suggests that any practices (behaviours) are determined by the person's attitude and knowledge towards the behaviours.

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. Hence, understanding nursing students' knowledge attitude and practice regards to SARS-CoV-2 will aid in the development of appropriate and tailored strategies and intervention tools to address poor practices, improve knowledge and change attitudes.

## Materials and methods

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 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. The on-line questionnaire was created using Google forms® and all data was deposited in an electronic database protected by password, known only to the data manager. 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. 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 voluptuous habits. According to guidelines for clinical and community management of COVID-19 by the Ministry of Health of Italy [13], a KAP Survey was designed and modified from previously published research articles [14, 15]. 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. The survey instrument assessed the knowledge of nursing students by asking questions about the nature, aetiology, symptoms, risk group, consequences, source of transmission, prevention and treatment of SARS-CoV-2. 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 < 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. For all qualitative variables absolute and relative frequencies have been calculated; categorical variables were analysed by Pearson's Chi-square test ($\chi^2$). A multivariate linear regression was performed, considering it as a dependent variable "Practice score", in order to evaluate the role of the variables in the first section of the questionnaire. The statistical significance level chosen for all analyses was 0.05. The results were analysed using the STATA statistical software version 14 [16]. Results are expressed as adjusted Odds Ratio (aOR) with 95% Confidence Intervals (95% CI).

## Results

A total of 575 nursing students were included (response rate of 99.3%). Table I shows the demographic characteristics of the participants and shows the Knowledge, Attitude and Practice scores. The study showed that the mostly participants were female (68.7%) and the mean age was 22.29 ± 4.23. In relation to the year of study, 34.3% of participants

reported attending the first year of study, 32.2% in the second year, 24.9% in the third year and 8.70% were off course. Moreover 20.5% reported a low economic status whilst 90.9% enjoy a medium-high health status. For more details see Table I. Figure 1 describes the current status about SARS-CoV-2 knowledge among nursing students. A total of 554 (94.6%) respondents showed good knowledge while 31 (5.4%) of nursing students had poor knowledge of SARS-CoV-2. The study showed that poor knowledge was more apparent in response to questions regarding the aetiology, risk group, incubation time, correct timing for washing hands with soap, diagnosis and treatment of SARS-CoV-2 in which the rate of incorrect responses were 28.9, 30.6, 56.3, 94.8, 42.1 and 19.3% respectively.

Tab. I. Description of the sample (n = 585).

| | | N (%) |
|---|---|---|
| Gender | Male | 180 (31.30) |
| | Female | 395 (68.70) |
| Year of study | First | 197 (34.26) |
| | Second | 185 (32.17) |
| | Third | 143 (24.87) |
| | Off-course | 50 (8.70) |
| Perceived economic status | Medium-high | 457 (79.48) |
| | Low | 118 (20.52) |
| Perceived health status | Medium-high | 523 (90.96) |
| | Low | 52 (9.04) |
| Knowledge score | Good knowledge | 554 (94.60) |
| | Poor knowledge | 31 (5.40) |
| Attitude score | Positive attitude | 521 (90.60) |
| | Negative attitude | 54 (9.40) |
| Practice score | Good practice | 511 (88.87) |
| | Poor practice | 64 (11.13) |
| Mean age | | 22.29 ± 4.23 |

Mean knowledge score of nursing students was 10.2 ± 1.14. Figure 2 show the current status about SARS-CoV-2 attitude among nursing students. Of 575 respondents, 521 (90.6%) showed positive attitude while 54 (9.4%) participants displayed negative attitude about SARS-CoV-2. Mean attitude score of nursing students was 1.5 ± 0.39. The most negative attitude was shown when asked whether their own participation in infection control program could reduce the prevalence of SARS-CoV-2. Conversely, majority of participants responded positively when queried about the use of protective measures and the importance of share information about SARS-CoV-2. Figure 3 describes the practices of the studied samples regarding infection control measures. The overall mean practice score was 6.9 ± 1.20. The most of the studied sample (88.9%) reported good practice and 11.1% reported poor practice. Items and relative answers are summarized in Figure 3. Table II shows bivariate associations between knowledge, attitude, practice score and years of university course attended. The overall score indicates good knowledge among first year (95.4%), second year (95.6%), third year (95.1%) off-course (86.0%) and showed statistically significant (p = 0.046). In a similar way, the overall score indicates good practices among first year (93.9%), second year (87.6%), third year (85.3%) off-course (84.0%) and showed statistically significant (p = 0.038). No statistically significant results were showed for the overall score of attitudes. Multivariate linear regression showed that Attitude score (β = -0.29; p = 0.024) and Knowledge score (β = 0.10; p = 0.026) adjusted for age, gender, year of study, perceived economic status, perceived health status was significantly associated with Practice score (Tab. III).

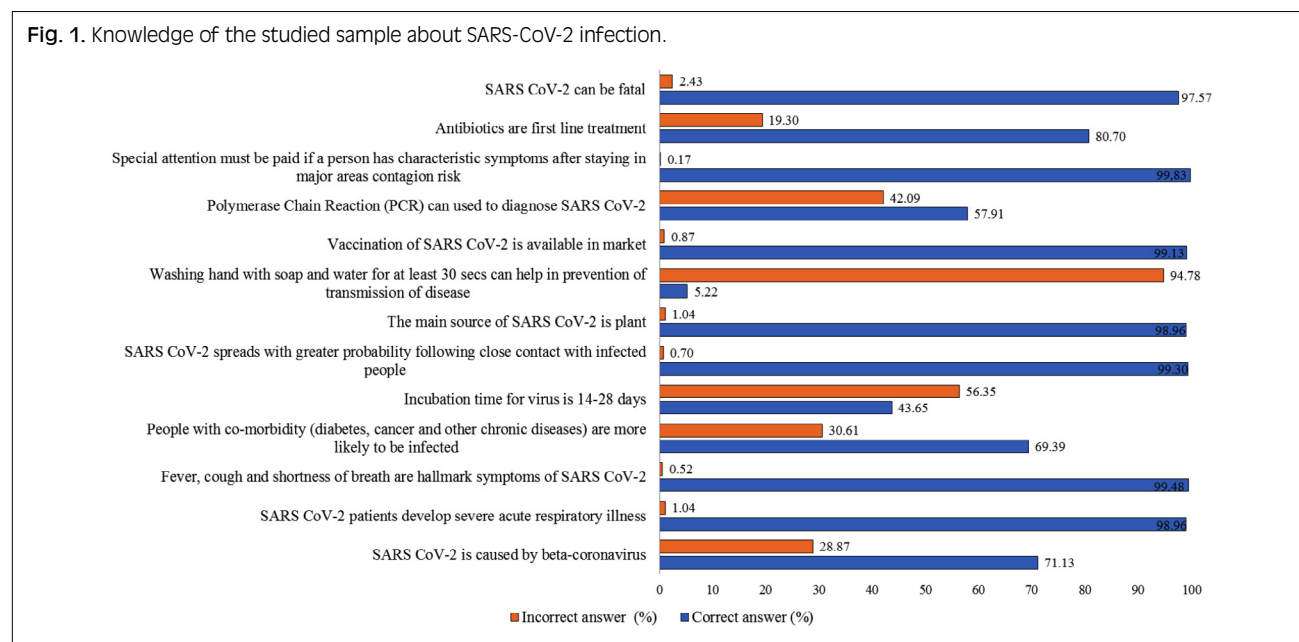Fig. 1. Knowledge of the studied sample about SARS-CoV-2 infection.

**Fig. 2.** Attitude of the studied sample towards SARS-CoV-2 infection (SA = strongly agree, A = agree, U = undecided, D = disagree, SD = strongly disagree).
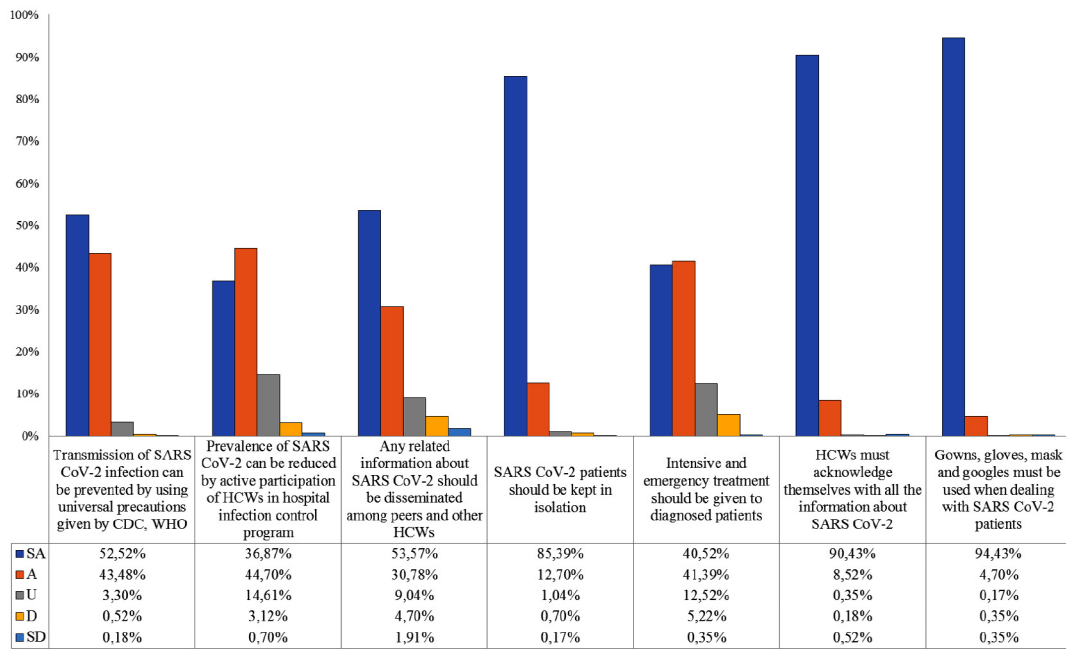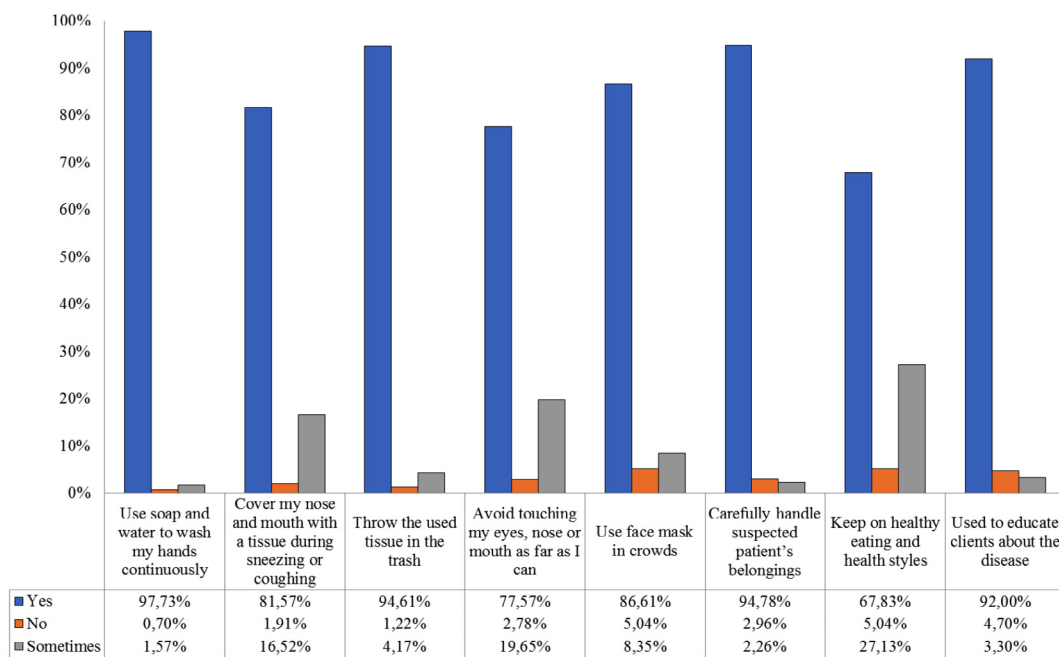


| | Transmission of SARS CoV-2 infection can be prevented by using universal precautions given by CDC, WHO | Prevalence of SARS CoV-2 can be reduced by active participation of HCWs in hospital infection control program | Any related information about SARS CoV-2 should be disseminated among peers and other HCWs | SARS CoV-2 patients should be kept in isolation | Intensive and emergency treatment should be given to diagnosed patients | HCWs must acknowledge themselves with all the information about SARS CoV-2 | Gowns, gloves, mask and googles must be used when dealing with SARS CoV-2 patients |
|---|---|---|---|---|---|---|---|
| SA | 52,52% | 36,87% | 53,57% | 85,39% | 40,52% | 90,43% | 94,43% |
| A | 43,48% | 44,70% | 30,78% | 12,70% | 41,39% | 8,52% | 4,70% |
| U | 3,30% | 14,61% | 9,04% | 1,04% | 12,52% | 0,35% | 0,17% |
| D | 0,52% | 3,12% | 4,70% | 0,70% | 5,22% | 0,18% | 0,35% |
| SD | 0,18% | 0,70% | 1,91% | 0,17% | 0,35% | 0,52% | 0,35% |

**Fig. 3.** Practices of the studied samples regarding infection control measures.



| | Use soap and water to wash my hands continuously | Cover my nose and mouth with a tissue during sneezing or coughing | Throw the used tissue in the trash | Avoid touching my eyes, nose or mouth as far as I can | Use face mask in crowds | Carefully handle suspected patient's belongings | Keep on healthy eating and health styles | Used to educate clients about the disease |
|---|---|---|---|---|---|---|---|---|
| Yes | 97,73% | 81,57% | 94,61% | 77,57% | 86,61% | 94,78% | 67,83% | 92,00% |
| No | 0,70% | 1,91% | 1,22% | 2,78% | 5,04% | 2,96% | 5,04% | 4,70% |
| Sometimes | 1,57% | 16,52% | 4,17% | 19,65% | 8,35% | 2,26% | 27,13% | 3,30% |

**Tab. II.** Mean score of knowledge, attitude and Practices of nursing students about SARS-CoV-2.

| | Knowledge N (%) | | | Attitude N (%) | | | Practices N (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Good | Poor | P-value | Positive | Negative | P-value | Good | Poor | 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) | 0.046 | 168 (90.81) | 17 (9.19) | 0.220 | 162 (87.57) | 23 (12.43) | 0.038 |
| Third year | 136 (95.10) | 7 (4.90) | | 135 (94.41) | 8 (5.59) | | 122 (85.31) | 21 (14.69) | |
| Off-course | 43 (86.00) | 7 (14.00) | | 43 (86.00) | 7 (14.00) | | 42 (84.00) | 8 (16.00) | |

Used Pearson chi-square test.

Tab. III. Multivariate linear regression. Each independent variable is adjusted for the other independent variable and for age, gender, year of study, perceived economic status, perceived health status. Based on 575 observations.

| Independent variables | Dependent variable: practice score | | |
|---|---|---|---|
| | β | 95% CI | P-value |
| Attitude score | -0.29 | -0.54/-0.04 | 0.024 |
| Knowledge score | 0.10 | 0.01/0.18 | 0.026 |

$R^2 = 0.04$.

## Discussion

To date, April 6th, 2021, according to data published daily by the WHO [17], Italy is the second Country in European Community in terms of confirmed cases of COVID-19 with the sad primacy of deaths, and only 10% of the population received at least the first dose of the vaccine. The contrast action at SARS-CoV-2 has involved healthcare professionals, and in our KAP Survey we analyse the knowledge, attitude and practices of the students of the nursing degree course in relation to SARS-CoV-2. Among the students of the nursing degree course of the University of Palermo there is a good general knowledge of SARS-CoV-2, in accordance with what emerges in literature as regards medical students [18], considered the absence of data for similar studies on nursing students. As specified in Table II, 94.6% of the students obtained a score ≥ 9, although as can be estimated from the percentages of exact answers especially to questions K5-K8-K10, the increase in the degree of detail of the question corresponds the decrease in the percentage of correct answers. More specifically, the respondents present a greater knowledge of the symptoms of SARS-CoV-2 infection, of the transmission modalities, and on the availability of a vaccine, as evidenced by the exact answers to questions K2-K3-K6-K7-K9-K11-K13 (Fig. 1) and intermediate knowledge in relation to the characteristics of the virus and the treatment of the disease, as evidenced by the answers to questions K1-K4-K5-K10-K12 (Fig. 1). Special mention for question K8 ("Washing hand with soap and water for at least 30 secs can help in prevention of transmission of disease"), which has just 5.22% of correct answers from students, probably confused from the temporal data reported in question K8 (30 secs), in line with the times suggested on the portal dedicated to SARS-CoV-2 of the Italian Ministry of Health [19, 20]. We can say that there is a degree of knowledge inversely proportional to the difficulty of the question. The "attitude" parameter, in absolute value, improves from the first to third year of the course of study as reported in Table II, more specifically, among the interviewees there was greater indecision ("U") and disagreement ("D") for questions A2-A3-A5 as shown in Figure 2, all questions that directly concern the communication between HCWs and between hospitals and HCWs [21]. A good method to avoid information overload for health professionals who are on the front line, considering that we are experiencing a historical moment in which the influx of new information is extremely rapid and from multiple sources (hospital administration, scientific societies, departments of prevention, social media, guidelines on the use of PPE, etc.) 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 [22], summaries should be created using data from official sources. The Practices parameter worsens from the first to the third year of the degree course, but overall the interviewees have habits, in most cases, substantially correct, exception made for P2-P4-P7 (Fig. 3), for which the response "Sometimes" highlights how the habit of "Cover nose and mouth with a tissue during sneezing or coughing", "Avoid touching my eyes, nose or mouth as far as I can "," Keep on healthy eating and health styles "have not yet been perfectly metabolized by a portion of the students. We underline that in our study Knowledge - Attitude - Practices (KAP) on SARS-CoV-2 the increase in knowledge scores ("K" Score) was significantly associated with a lower probability of negative attitudes ("A" Score low) and finally an improvement of the practice (increase of the "P" Score). The results of our KAP Survey on the students of the Nursing degree course of the University of Palermo, although positive, 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 attitudes and practices [23]. To ensure ultimate success against SARS-CoV-2, the adherence of subjects to social distancing and prevention measures is fundamental but is largely influenced by their knowledge, attitudes and practices (KAP) against the virus and disease, according to the KAP theory [11, 12].

## Study limitations

The results of this study should be used with caution for generalization as it describes the situation of nursing students in an area of Sicily (University of Palermo), Southern Italy, this may not allow the results to be generalized to other locations and cities. Additionally, self-reporting practices may not be effective; therefore further studies are warranted. In addition, the KAP measurement may be inaccurate due to different classification systems. The other limitation is that participants could give socially acceptable responses. For goodness of fit of the predictor model on practice, the $R^2 = 0.04$ is rather low to describe determinant factors; other factors need to be explored in future research.

## Conclusions

Our results suggest that nursing students of the University of Palermo have a good knowledge of SARS-Cov-2, associated with positive attitudes and appropriate practices towards COVID-19 during the epidemic; however, some of them show gaps about aetiology, risk

factors, diagnosis, transmission and treatment of the virus. Part of the sample shows the most negative attitude when asked whether their participation in the infection control program is necessary to prevent the prevalence of SARS-CoV-2. Nonetheless, they reported adequate practices towards infection. This requires interventions for a proper health education. However, there must be effective and timely communication from the Ministry of Health on the pandemic and good practices through online seminars and in hospitals. The benefits of safe practices such as hand hygiene, maintaining a safe social distance and wearing masks go far beyond containing SARS-CoV-2 disease, in fact it could be an opportunity to implement these practices and make them permanent. Health education programs are useful for encouraging optimistic attitudes and maintaining safe practices, and undoubtedly the highest and noble purpose is prevention. Health education is an essential component of the defence and promotion of health, where surveillance and infection control measures are basic for global public health and certainly this is a topic that fully affects the future category of nurses or other HCWs.

## 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.

## Acknowledgements

## Conflict of interest statement

The authors declare no conflict of interest.

## Authors' contributions

AF, SP and OES conceived, designed, coordinated and supervised the research project. SP and OES performed the data quality control, optimized the informatics database, OES performed the statistical analyses and evaluated the results. SP, OES, FA, GP, AA, ML, AT, GD and AF wrote the manuscript. All Authors revised the manuscript and gave their contribution to improve the paper. All authors read and approved the final manuscript.

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