Knowledge, Attitude, Beliefs and Practice of COVID-19 among Primary and Secondary School learners in Kenya

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Abstract

The first case of COVID-19 in Kenya was confirmed in March 2020. Upon confirmation in Kenya, the Ministry of Health (MoH) through the National Emergency Response Committee on Coronavirus (NERCC) implemented a mix of public health response measures. No study has been conducted in Kenya to establish the knowledge, attitude, beliefs and the preventive behaviours of the pandemic among primary and secondary school learners. Across-sectional descriptive study was conducted where a total of 2798 learners across five counties of Kenya responded to the knowledge, attitude, beliefs and practice (KABP) questionnaire. The data collected was analyzed using both descriptive and inferential statistics, and tested at α=.05. The findings revealed that over 96% of the respondents were able to correctly identify the signs, symptoms and prevention measures of COVID-19. Also, statistical insignificance ($\chi^2 = 8.171$, $p < .05$) existed between counties and the learners' knowledge on prevention methods of COVID-19. On attitude, statistical significant differences ($\chi^2 = 65.79$, $p < .05$) existed between counties in the learners' attitude towards COVID-19. However, statistical significant differences ($\chi^2 = 34.710$, $p < .05$) was found between primary, secondary and special school learners' attitude towards COVID-19. It was established that no significant gender difference (F=2.719, p>.05) existed in the beliefs of COVID-19. Practices towards COVID-19 were statistically associated with knowledge, attitudes and beliefs toward the disease. It was concluded that practices of preventive behaviours among learners can be affected by knowledge, attitudes and beliefs. In effect, these aspects should be considered during pandemics.

Keywords: Attitude, Belief, COVID-19, Knowledge, Practice, School learners

1. Introduction

The COVID-19 global pandemic first appeared in Wuhan, China in December 2019 [1], [2]. Since then, the virus has infected millions globally. The COVID-19 pandemic was declared a Public Health Emergency of International concern (PHEIC) by the World Health Organization in January 30, 2020, meaning the countries of the world were to take urgent and aggressive action against the transmission of the virus. In Kenya, when the first case of COVID-19 was confirmed in early March 2020, the Kenya Ministry of Health (MoH), through the National Emergency Response

Committee on Coronavirus (NERCC) implemented a mix of public health response measures, including messaging to create awareness on preventive measures, such as use of masks, practicing hand hygiene and social distancing [3] and [4]. Other measures included shut down of public places such as educational and religious institutions, dusk to dawn curfew across the country and social gatherings among measures to reduce the spread of the disease. The government also created strict screening points at all locations of entry to the country to detect COVID-19 including roads, airports, buses and train stations [5].

Despite the government efforts to curtail the spread of the pandemic through the various measures put in place, COVID-19 cases continued to rise for some time in Kenya. In fact, responding to the pandemic in Kenya and globally had become a challenge because little was known about the clinically proven treatments and the epidemiological evidence of the pandemic, including its transmission dynamics among others [1]. According to [6], [7] and [8], in times of rising heightened concerns of a disease, health officials and policy makers need to engage the affected population with precautionary behaviours. In fact, [7] notes that in the core of a pandemic, educating, engaging and mobilizing the public to be active participants may likely enhance public health emergency preparedness thus reducing the population's vulnerability. This implies that when the public collectively engage in effective preventive practices that include hand hygiene, limiting mobility, social distancing and putting on face masks, there is a high chance of controlling the transmission of the disease. [4] notes that young people that includes school going children are likely to contribute to the spread of the virus, given their high population and mobility. Hence a routine practice of precautionary behaviours among this population must become a norm. However, to sustain such behaviours critical social, cognitive and psychological factors mediating such behaviours must be taken into consideration. Cognizant of such factors, the researchers therefore conducted a Knowledge, Attitudes, Beliefs and Practice survey on COVID-19 among school learners in Kenya.

According to [3], knowledge and practice are important factors regarding health prevention and promotion. Previous studies on infectious disease epidemics have also revealed that knowledge and awareness [9], [10] and [11] and efficacy beliefs [7] as cited in [12], are motivational factors in the adoption of preventive practices. Other similar studies have established that a higher level of knowledge is positively associated with practice of preventive measures [13], [14], [15], [16] and [17]. Also, attitudes related positively with preventative behaviours (13], [15], [16] and [17]. On gender and behavioural factors related to COVID-19, prior studies have shown that males showed lower knowledge as compared to their female counterparts [3] [4] [18] and [14]. Other studies have revealed that gender affect students' attitudes and practices [3]. Most of these studies were conducted among health professionals and the general public with limited studies conducted among school learners. The five counties were chosen because at the time of the study, they were the counties that had recorded the highest number of COVID-19 reported cases.

2. Objectives

(i) Determine the knowledge, attitude, beliefs and practice of COVID-19 among primary and secondary school learners in Kenya.

(ii) Establish the relationship between primary and secondary school learners' knowledge, attitudes, beliefs and practice of COVID-19.

3. Materials and Methods

3.1 Study Design

The researchers adopted a cross-sectional descriptive design to evaluate the primary and secondary school learners' levels of knowledge, attitudes, beliefs and practices of COVID-19. Descriptive design seeks to establish factors associated with certain occurrence, outcomes or outcome conditions [19], [20]. It is best adapted to obtain personal and social factors, beliefs and attitudes.

3.2 Participants

The study participants were 2798 learners drawn from five counties of Kenya namely: Nairobi, Mombasa, Kajiado, Migori and Elgeyo-Marakwet. Training of research assistants and pilot testing of the data collection tool were undertaken by the researchers. Appropriate data quality checks were conducted regularly throughout the data collection period.

3.3 Measurements

The respondents' knowledge of COVID-19 among school learners was assessed by asking them whether they had heard of COVID-19, correctly indicate some signs and symptoms of COVID-19, and methods used to prevent the spread of COVID-19. Seven (7) signs and symptoms, and nine (9) measures (some correct and others incorrect) were given to the respondents. The respondents were expected to respond to the items by indicating either "Yes" or "No". To measure attitudes related to COVID-19, six (6) items that mainly examined the perceived risk of contracting COVID-19 were developed and the respondents were to respond by "Agreeing", "Not sure" or "Disagreeing". Concerning beliefs, respondents responded to twelve (12) items by Agreeing", "Not sure" or "Disagreeing with them. Finally, precautionary behaviour practices were measured using nine (9) items that mainly covered the COVID-19 preventive measure. In this aspect, the respondents were to respond by indicating either "All the time", "Sometimes" and Not at all". All the respondents' responses were converted into frequencies and percentages. The characteristics of participants considered were: Counties, school category and gender.

3.4 Ethical Considerations

The study ethical approval was obtained from Egerton University Institutional Scientific and Ethics Review Committee prior to conducting the study (EUREC/APP/146/2021). A Research permit was also obtained from the Kenya's National Commission for Science, Technology and Innovations (License No: NACOSTI/P/21/14563). Informed consent was sought from the respondents before collecting information from them. The respondents had an option of terminating the study at any time. The study team protected the confidentiality of respondents. The participation of respondents less than 18 years were consented by the head teachers of their respective schools.

3.5 Data processing and Analysis

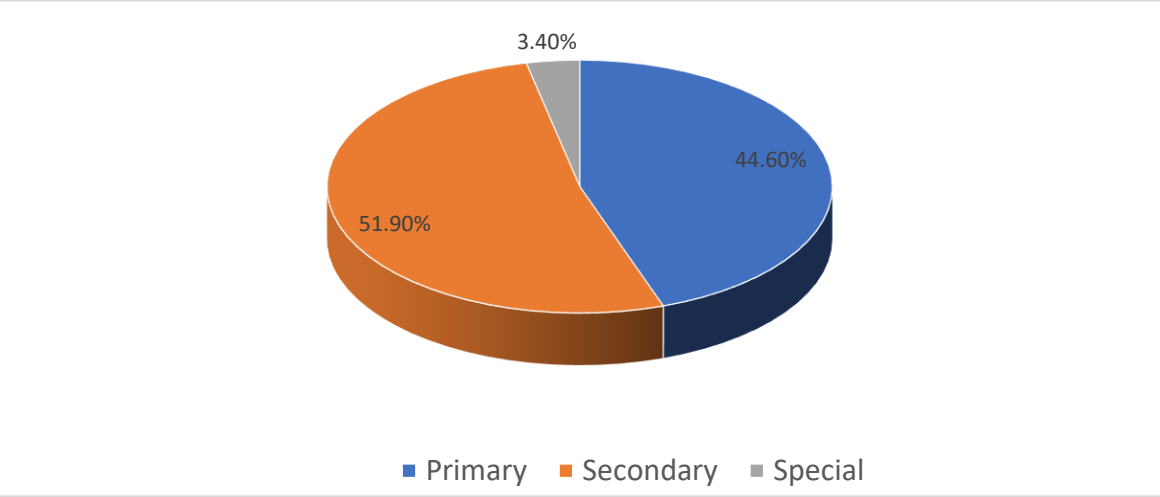
The data collected was analyzed using SPSS to generate basic descriptive tables and tested for differences by category using chi-square tests and where applicable ANOVA and correlations were applied. Tabulations were given as per county, school category, gender. All statistical tests were at α=.05. Prior to data analysis, the data was cleaned in preparation for the descriptive and inferential analyses.

4. Results

4.1 Demographic Characteristics of study respondents

A total of twelve (12) schools were involved in the study in each of the five counties with five (5) being primary, five (5) secondary and two (2) were special needs schools except for the Kajiado County where one special school was involved. In each school, knowledge, attitudes, beliefs and practices (KABP) questionnaire was administered. Data from a total of 2798 learners (primary-1249; secondary-1453 and special schools-96) was collected, coded and keyed in excel for analysis. Figure 1 gives the information on the distribution of learners as per the school category.

Figure 1. Proportion of Respondents per School category



From figure 1, the majority of learners were from secondary school type. The small proportion of special school learners is a reflection of the situation in the country and globally.

4.2 Learners' Knowledge of COVID-19

The knowledge of COVID-19 among school learners was determined by asking them whether they had heard of COVID-19, correctly indicate some signs and symptoms of COVID-19, and methods used to prevent the spread of COVID-19. Seven (7) signs and symptoms, and nine (9) measures (some correct and others incorrect) were given to the respondents. The learners were expected to respond to the items by indicating either "yes" or "no". Table 1, gives the details of the results.

4.2.1 Learners' Knowledge on Signs and Symptoms of COVID-19

From Table 1, over 91% of the learners correctly identified five of the signs and symptoms of COVID-19 out of the seven examined. This implies that the respondents' knowledge level on key signs and symptoms of COVID-19 was high. Loss of hearing and sight which were distracters attracted over 50% of the respondents. This may be an indication that though these symptoms may not have been scientifically identified as those of COVID-19, the respondents may have observed them in some of the COVID-19 patients

Table 1.

Knowledge on Signs and Symptoms

Knowledge Items	Numbers and Percentages of learners' responses	
	Yes F (%)	No F (%)
Fever	2472 (99.0)	26 (1.0)
Loss of appetite	1636(96.1)	67(3.9)
Chest pains	2256(98.8)	27(1.2)
Persistent cough	2407(98.7)	32(1.3)
Loss of hearing	213(55.2)	173(44.8)
Loss of sight	332(67.8)	158(32.2)
Loss of taste	1115(91.3)	106(8.7)

Source: Field data

4.2.2 Learners' Knowledge on Prevention methods of COVID-19

From Table 2, over 98% of the respondents identified correctly each of the key prevention measures. This indicates that the learners had high levels of knowledge about COVID-19 transmission prevention measures with majority of the learners being able to identify correctly eight out of the nine prevention methods presented.

Table 2.

Knowledge on Prevention methods

Knowledge on Prevention methods	Numbers and Percentages of learners' responses	
	Yes F (%)	No F (%)
Wearing a mask properly	2709(99.7)	7(0.3)
COVID-19 Vaccination	2501(99.0)	26(1.0)
Washing hands with soap	2603(99.5)	14(0.5)
Holding each other	327(12.0)	2402(88.0)
Proper Waste disposal/dustbin	1622(59.8)	1089(40.2)
Covering our mouths while coughing	2638(99.8)	4(0.2)
Using safe and clean	2208(81.2)	510(18.8)
Social distancing (1.5 meter)	2664(99.7)	8(0.3)
Not shaking hands	2463(98.8)	31(1.20

Source: Field data

A cross-tabulation between counties done by using chi-square showed statistical significance ($\chi^2 = 26.146, p < .05$) between counties and the learners' knowledge on signs and symptoms of COVID-19. The same statistical significance was observed between primary, secondary and special school learners ($\chi^2 = 34.710, p < .05$). On the contrary, there was statistical insignificance ($\chi^2 = 3.386, p < .05$) between female and male learners. Likewise, on precautionary behaviour measures, statistical insignificance ($\chi^2 = 8.171, p<.05$) was established between counties and the learners' knowledge on prevention methods of COVID-19.

4.3 Learners' Attitude towards COVID-19

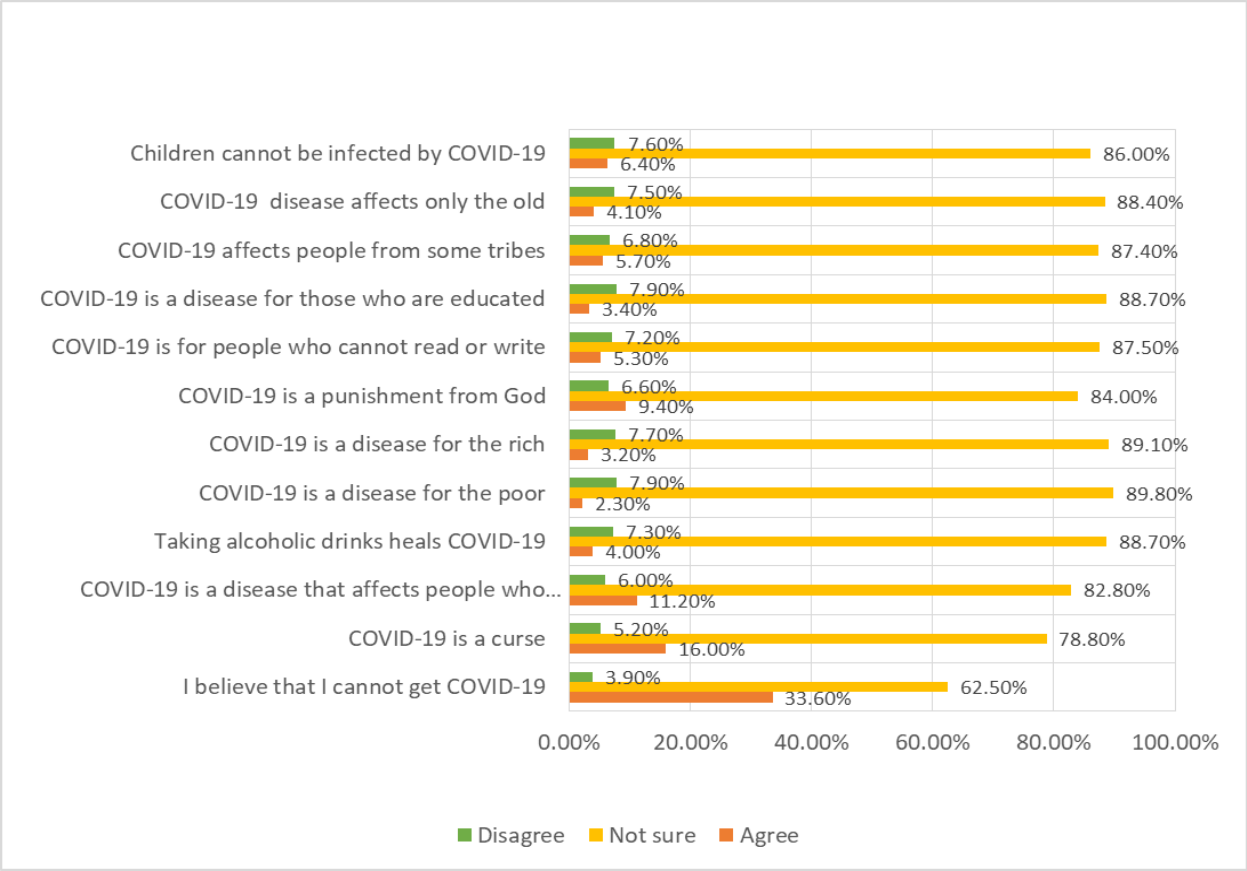
A six (6) item questionnaire was developed to assess the attitude of primary and secondary school learners towards COVID-19. The learners were expected to respond to the items by "Agreeing", "Not sure" or "Disagreeing". Approximately eighty two (81.5% of the learners were in agreement that COVID-19 is more serious than the common flu, will lose friends if they suffered from COVID-19 (52.7%), and people will run away or keep off from them if they suffered COVID-19 (55.1%) and would like to be vaccinated against COVID-19 (53.0%). From these responses, the respondents positively perceived the risk of becoming infected with COVID-19, thus was concluded that this enhanced their positive attitude towards the dangers of contracting COVID-19. A cross-tabulation between counties showed statistical significance ($\chi^2 = 65.79, p < .05$) between counties and the learners' attitude towards COVID-19. Further cross-tabulations showed statistical significance ($\chi^2 = 34.710, p < .05$) between primary, secondary and special school learners in their attitude towards COVID-19. On gender, no statistical significance was established between male and female learners attitude towards COVID-19 ($\chi^2 = 34.710, p > .05$).

4.4 Learners' Beliefs about COVID-19

A twelve (12) item questionnaire was developed to assess the beliefs of school learners on COVID-19. The learners were expected to respond to items on beliefs by "Agreeing", "Not sure" or "Disagreeing."

Figure 3 indicates responses on various beliefs from the learners. The learners were expected to disagree to all the items in order for them to be judged to be having the appropriate beliefs of COVID-19. Interestingly, less than 8% of the learners disagreed to each of the belief items, less than 17% of the learners agreed to the items except the item "I believe that I am not able to get COVID-19" which attracted 33.2% and the majority (> 62%) of the learners were not sure in each of items.

Figure 3. Learners' Responses of their Belief towards COVID-19

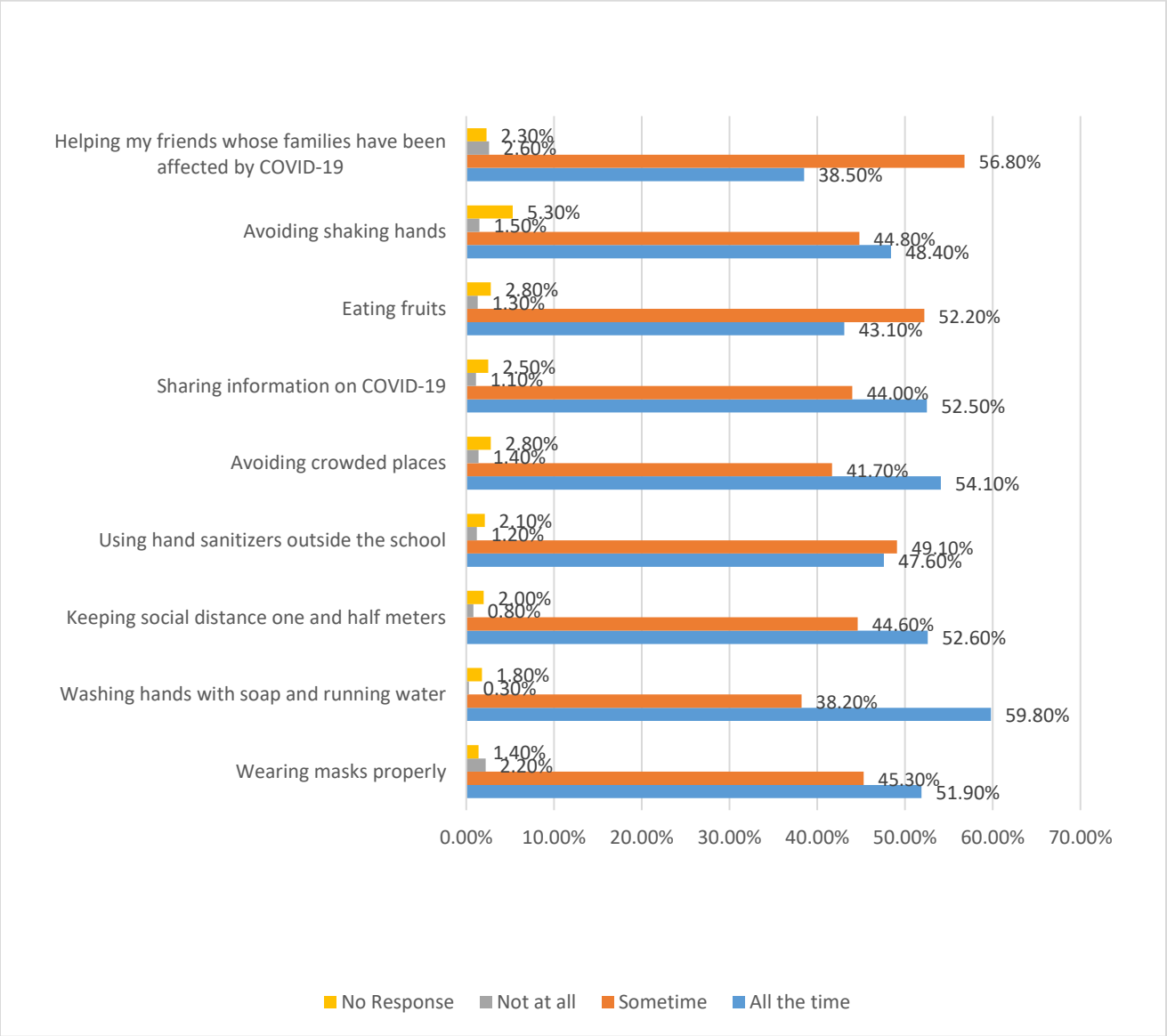


A cross-tabulation between counties showed statistical insignificance ($\chi^2 = 198.8, p > .05$) between counties and the learners' beliefs of COVID-19. Further cross-tabulations showed no statistical significance ($\chi^2 = 60.89, p > .05$) between primary and secondary school learners in their beliefs of COVID-19. Insignificant gender difference ($F=2.719, p>.05$) was also established by the study.

4.5 Learners' Practices for COVID-19

A nine (9) item questionnaire was developed to assess the practices adopted by school learners in the prevention of the infection or spread of COVID-19. The learners were expected to respond to whether they adopted the various practices "All the time", "Sometime" or "Not at all". Figure 4, gives the details of the results.

Figure 4. Proportion of Learners responses to COVID-19 preventive measures



From Figure 4, it is observed that generally over 50% of the learners practiced at all the time the key COVID-19 precautionary behaviour measures that included wearing face masks properly (51.9%), washing hands with soap and running water (59.8%),keeping social distance of one and half meters (52.6%), and avoiding crowded places (54.1%). In the use of sanitizers outside school, a higher proportion of learners (49.1%) indicated sometimes, which may be attributed to the cost of the commodity which, it may have been difficult for most of the participants to afford. Interestingly, avoiding shaking of hands which is a key prevention measure was practiced by only 48.4% of the learners all the time. In fact a worrying proportion (5.3%) of participants did not give a response on this, indicating not sure of what to say. A cross-tabulation between counties showed statistical insignificance ($\chi^2 = 105.5, p > .05$) between counties and the learners' practice of COVID-19 measures. Further cross-tabulations between school levels showed no statistical significance ($\chi^2 = 22.46, p>.05$) between primary, secondary and special school learners and the

practice of COVID-19 measures. On gender, significant difference (F=.906, *p*<.*05*) was recorded between male and female learners in the practice of COVID-19 measures, with the female learners showing a higher percentage of adoption of positive behaviour as compared to their male counterparts.

4.6 Relationship between Learners' Knowledge, Attitudes, beliefs and Practice

In the study, further analysis was done on the relationship between knowledge, attitudes, beliefs and practice (KABP). The findings are presented in Table 3.

Table 3. *Correlations between Knowledge, Attitude, Beliefs and Practice*

Variable	Knowledge on Signs and symptoms	Knowledge on Prevention Methods	Attitude	Belief	Practice
Knowledge on Signs and symptoms score	1				
Knowledge on Prevention Methods score	.038 (*p*>.05)	1			
Attitude score	.032 (*p*>.05)	.035 (*p*>.05)	1		
Belief score	.81*(*p*<.05)	-.027 (*p*>.05)	.006(*p*>.05)	1	
Practice score	.048* (*p*<.05)	.076* (*p*<.05)	.184*(*p*<.05)	.122*(*p*<.05)	1

From Table 3, the findings reveal that knowledge on signs and symptoms significantly related to beliefs (r=.081, p <.05) and practices (r=.048, *p* <.05). In effect, those with higher knowledge in signs and symptoms were more likely to have the right beliefs and were more likely to adopt prevention practices compared to those with less knowledge. This implies that providing sufficient and precise information during a pandemic helps in correcting inaccurate and misguided information thus correcting existing beliefs emanating from culture and systems during a health crisis. In the same vein, the indirect effects of knowledge on preventative behaviors significantly mediated the COVID-19 practices (r=.184, *p*<.*05*). In addition, attitudes and beliefs significantly influenced the adoption of COVID-19 prevention practices. Of greater observation is that knowledge, attitudes and beliefs significantly influenced the practice of preventive behaviours.

5. Discussion:

On the knowledge of COVID-19, a high proportion of the learners correctly identified five of the signs and symptoms of COVID-19 out of the seven examined. This implies that the respondents' knowledge level on key signs and symptoms of COVID-19 was high. These findings corroborate those of [21] where their study established that 99 % of their respondents had good knowledge of COVID-19. Other similar studies showed the same trend [22], [23], [24], [25], [3] [26], [27]. According to [28], knowledge is a significant factor regarding health prevention and promotion. This involves identification of symptoms and available methods of treatment and consequences.

In effect, knowledge can play a crucial role in enhancing the practice of public preventive behaviour [12]. On prevention measures, learners revealed a high levels of knowledge about COVID-19 transmission prevention measures. The finding supports those of [4], which found that over 88% of the respondents of their study correctly indicated the COVID-19 prevention methods. On attitude towards COVID-19, over 52% of the learners had appropriate attitude towards the disease. This suggest that majority of the learners perceived the risk of becoming infected with COVID-19 thus were more willing to adopt measures aimed at curtailing the transmission of COVID-19. This study findings contradict those of [29] who established high prevalence of poor attitude towards COVID-19 among their study participants in Rwanda. Other studies have reported low prevalence of poor attitude in Saudi Arabia [30] and China [31]. Concerning beliefs, the current study found low levels efficacy beliefs of COVID-19 among the school learners with most of them taking a neutral position. According to [12], persons with higher efficacy beliefs of COVID-19 are more likely to effectively practice the appropriate prevention measures. Therefore, efficacy beliefs have significant effect on disease preventive behavior. In fact, [12] further established that efficacy beliefs significantly mediated the relationship between knowledge of COVID-19 and three preventive behaviours (wearing a facial mask, practicing hand hygiene, and avoiding crowded places). Individuals form self-efficacy beliefs by interpreting information regarding their own capabilities. If people believe they can manage threats that come on their way they are not distressed by them, but if they believe they cannot control potential threats, they experience high anxiety. In this study, the majority of the respondents indicating "not sure" implies that either the learners were experiencing a high anxiety of the pandemic or they still lacked sufficient knowledge about COVID-19. In effect, pandemic related efforts should prioritize populations who have low efficacy beliefs, particularly the youth and children who may have low knowledge levels of COVID-19. Insignificant difference between primary, secondary and special school learners, and their gender in beliefs of COVID-19 was established by the study. These findings are in support of [4] study which established that majority of the youth in Kenya adopted more positive practices on health protocols to avoid the COVID-19 despite some beliefs within communities.

On practices, over 50% of the learners practiced at all the time the key COVID-19 precautionary behaviour measures. The findings are in line with a study conducted by [4] which established that in terms of practice, majority of the youth in Kenya adopted more to positive behaviour practices to avoid infection that included washing of hands (99%), and use of masks (98%). In the use of sanitizers outside school, a higher proportion of learners (49.1%) in this study indicated sometimes, which may be attributed to the cost of the commodity which, it may have been difficult for most of the participants to afford. According to [5], many of the recommended practices to control the spread of COVID-19 present particular challenges for persons living in poverty. Interestingly, avoiding shaking of hands which is a key prevention measure was practiced by only 48.4% of the learners all the time. In fact a worrying proportion (5.3%) of participants did not give a response on this, indicating not sure of what to say. This could be attributed to the African culture which the participants have been brought up in where shaking of hands is a common form of greeting. Thus practices on preventative measures should be improved in the general population cognizant of the cultural norms.

The statistical insignificance between counties and the learners' practice of COVID-19 measures contrasts a study that was conducted on practice of COVID-19 measures among households in Mombasa and Kilifi counties of Kenya where statistical significance was revealed among the two counties [3]. In this study, no statistical significance was established between primary, secondary

and special school learners and the practice of COVID-19 measures. This contrasts other earlier studies, where positive adoption behaviours to COVID -19 control measures were linked to higher education levels [24], [32], [25]. On gender, significant difference was recorded between male and female learners in the practice of COVID-19 measures, with the female learners showing a higher percentage of adoption of positive behaviour as compared with their male counterparts. The findings corroborate with those of [3] [25] and [24] which established that females were more likely to practice measures put in place to combat COVID-19 which contrast findings of similar studies in India and Cameroon where females were found to be less likely to practice key preventative behaviours compared with their male counterparts [33], [34].

Finally, the study established that knowledge, attitudes and beliefs significantly influenced the practice of preventive behaviours. This implies that promoting preventative behaviours toward COVID-19 would require promoting knowledge, attitude and beliefs among affected populations [12]. Moreover, according to [10], [11] and [13] as cited in [12] noted that earlier studies on infectious disease epidemics showed that knowledge and awareness motivated people to adopt preventive behaviours.

6. Conclusion

i. There was high basic knowledge of COVID-19 signs and symptoms and preventive measures among primary and secondary school learners. Thus, it is paramount to close knowledge gaps in a population in order to reduce gaps in health behaviors and outcomes.
ii. Knowledge, attitudes and beliefs have a significant influence on practicing preventive behavior, implying that adoption of preventive behaviours towards COVID-19 would require promoting knowledge, attitudes and beliefs among the affected populace

Recommendations

i. During health crises, there is need to consider beliefs stemming from culture and system which if they are in conflict with disseminated health information, they may profoundly affect behaviour change initiatives.
ii. Public health education programmes tailored for learners in school and aimed at improving a pandemic's related knowledge, attitude, beliefs and practice should be prioritized in all counties of Kenya during emergency responses.

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Authors' contributions

All the authors substantially contributed to the preparation and approved the final version of the manuscript.

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8. References

[1] Li Q, G. X., Wu P., Wang, X., Zhou, L., Tong Y., Ren R., …Wong J.Y. (2020). "Early Transmission Dynamics in Wuhan, China, of Novel Coronavirus–Infected Pneumonia", *N Engl J Med*. 382(13), 1199–1207.

[2] Zhu, N., Zhang, D., Wang, W., Li, X., Yang, B., Song, J., …Lu, R.(2020). "A Novel Coronavirus from Patients with Pneumonia in China", *N Engl J Med*, 382(8), pp. 727–733.

[3] Mwai, J., Mutai, K., Kaduka, L., Abdi, M., Ahmed, I., Ndemwa, …Omogi, J. (2022). "Association between Sociodemographic characteristics and Knowledge and Practice of COVID-19 measures among households in Mombasa and Kilifi County, Kenya", *International Health*, 1-24. https://doi.org/10.1093/inhealth/ihac049.

[4] Karijo, E., Wamugi, S., Lemanyishoe, S., Njuki, J., Boit, F., Kibui,…Abuya, T. (2021). "Knowledge, attitudes, practices, and the effects of COVID-19 among the youth in Kenya", *Research Square*. https://doi: 10.21203/rs.3.rs-34861/v3

[5] Battle, D. (2020). "The Impact of COVID-19 on Health Care, Education, and Persons with Disabilities in Kenya", *Ashawire,* https://doi.org/10.1044/2020_PERSP-20-00097

[6] Anderson, R.M., Heesterbeek, H., Klinkenberg, D., & Hollingsworth, T.D. (2020). "How will country-based Mitigation Measures Influence the course of the COVID-19 epidemic?", *Lancet,* 395 (10228), 931–934.

[7] Lee, M., & You, M. (2019). "Psychological and behavioural responses in South Korea during the early stages of coronavirus disease 2019 (COVID-19)", *Int j Environ Res Public Health*, 17(9), 2977-2986.

[8] Nelson C., Lurie N., Wasserman J., & Zakowski, S. (2007). "Conceptualizing and Defining Public Health Emergency Peparedness". *Am J Public Health*, 97, S9–S11.

[9] Lin, L., Jung, M., McCloud, R.F., & Viswanath, K. (2014). "Media use and communication inequalities in a public health emergency: A case study of 2009–2010 pandemic influenza, Avirus subtype H1N1", *Public Health Rep*, 129(6_ sup l4), 49–60.

[10] Aburto, N.J., Pevzner, E., Lopez-Ridaura, R., Rojas, R., Lopez-Gatell, H., Lazcano, E.,… Harrington, T.A. (2010). "Knowledge and Adoption of Community Mitigation efforts in Mexico during the 2009 H1N1 pandemic", *Am J Prev Med*, 39(5), 395–402.

[11] Brug, J., Aro, A.R., Oenema, A., De Zwart, O., Richardus, J.H., & Bishop, G.D. (2004). "SARS risk perception, knowledge, precautions, and information sources, the Netherlands", *Emerg Infect Dis*, 10 (8), 1486.

[12] Lee, M., Kang, B., & You, M. (2021). "Knowledge, attitudes, and practices (KAP) toward COVID-19: A cross-sectional study in South Korea", *BMC Public Health*, 21, 295. http://doi.org/10.1186/s12889-021-10285-y

[13] Papagiannis, D., Malli, F., Raptis, D.G., Papathanasiou., I.V., Fradelos, E.C., … Gourgoulianis, K.I. (2020)."Assessment of knowledge, attitudes, and practices towards new coronavirus (SARS-CoV-2) of health care professionals in Greece before the outbreak period", *Int J Environ Res Public Health*, 17(14), 4925.

[14] Lau, L.L., Hung, N., Go, D.J., Ferma, J., Choi, M., Dodd, W., Wei, X. (2020). " Knowledge, attitudes and practices of COVID-19 among income-poor households in the Philippines: A cross-sectional study", *J Global Health,*10(1), 11007.

[15] Afzal, M.S., Khan, A., Qureshi, U.U.R., Saleem, S., Saqib, M.A.N., Shabbir, R.M.K.,…

Ahmed. H. (2020). "Community-based assessment of knowledge, attitude, practices and risk factors regarding COVID-19 among Pakistanis residents during a recent outbreak: a cross-sectional survey", *J Community Health*, 1–11.

[16] Alrubaiee, G.G., Al-Qalah, T.A.H., Al-Aawar., M.S.A. (2020). "Knowledge, attitudes, anxiety, and preventive behaviours towards COVID-19 among health care providers in Yemen: an online cross-sectional survey", *BMC Public Health*, 20(1), 1541.

[17] Tamang, N., Rai, P., Dhungana, S., Sherchan, B, Shah B., Pyakurel, P., & Rai, S. (2020). "COVID-19: A National Survey on perceived level of knowledge, attitude and practice among frontline healthcare Workers in Nepal", *BMC Public Health*, 20(1), 1905.

[18] Sultana, M.S., Khan, A.H., & Islam, M.R. (2020). "Gender difference in attitude and preparedness to respond to COVID-19 among adult population in Bangladesh: Across-sectional study", retrieved January 23, 2022, from http://doi:10.20944/ preprints202011.0739.v1

[19] Kothari, C.R., & Garg, G. (2014). *Research Methods and Techniques*. New York: New Age International Ltd

[20] Borg, W.R., & Gall, M.D (1996). *Educational Research: An Introduction (4th ed.)*. London: Longman.

[21] Reuben, R.C., Danladi, M.M.A., Saleh., D.A., & Ejembi, P.E. (2021). "Knowledge, Attitude, and Practice towards COVID-19: An Epidemiological Survey in North-Central Nigeria", *J Community Health*, 46(3), 457-470. http://doi: 10.1007/s10900-020-00881-1

[22] Habib, M.A., Dayyab,F. M., lliyasu, G., & Habib, A.G. (2021). "Knowledge, Attitude, and Practice Survey of COVID-19 in Northern Nigeria", *PLoS One*, 16(1). https://doi.10.1371/journal.pone.0245176

[23] Adebowale, O.O., Adenubi, O.T., Adesokan, H.K., Oloye, A.A., Bankole, N.O., Fadipe.,… Akinyole, A.K. (2021). "SARS-CoV-2 (COVID-19 pandemic) in Nigeria: Multi-institutional survey of knowledge, practices and perception amongst undergraduate veterinary medical students", *PLoS One*, 16(3). http://doi:10.1371/journal.pone.0248189

[24] Molla, K.A.,& Abegaz, S.B. (2019). "Community knowledge, attitude and practices to SARS-CoV-2 disease 2019 (COVID-19): A cross-sectional study in Woldia town, Northeast Ethiopia", *PloS One*, 16(4). https://doi:10.1371/journal.pone.

[25] Bazaid, A.S., Aldarnami, A., Binsaleh, N., Sherwani,S., & Athomati, O.W. (2020). "Knowledge and practice of personal protective measures during the COVID-19 pandemic: A cross-sectional study in Saudi Arabia", *PLoS One*. https://doi:10.1371/journal.pone.0243695

[26] Ikhlaq, A., Bint-E-riaz, H., Bashir, I., & Ijaz, F. (2020). "Awareness and Attitude of Undergraduate medical students towards 2019-novel corona virus", *Pak J med Sci*. 36(COVID-19-S4):S32-6. https://doi.10.12669/pjms.36.

[27] Vaidya, B., Bhochhibhoya, M., Baral., R., & Nakami,S. (2020). "Knowledge, Attitude and Practice towards COVID-19 among patients with Musculoskeletal and Rheumatic Diseases in Nepal: A web-based cross-sectional study", *Research Square*, 1-12.

[28] Ferdous, M.Z., Islam, M.S., & Sikder, M.T. (2020). "Knowledge, Attitude, and Practice Survey regarding COVID-19 Outbreak in Bangladesh: An online-based Cross-sectional study", *PLoS One*, 15(10), 102-111.

[29] Iradukunda, P.G., Piere, G., Muhozi, V., Denhere, K., & Dzinamarira, T. (2021).

"Knowledge, Attitude and Practice Toward COVID-19 among people living with HIV/AIDS in Kigali, Rwanda", *Journal of Community Health*, 46, 245-250. https://doi.org/10.1007/s10900-020-00938-1

[30] Al-Hanawi., M.K., Angawi, K., Alshareef, N., Qattan, A.M., Helmy, H.Z., & Abudawood, Y. (2020). "Knowledge, Attitude and Practice Toward COVID-19 among the public in the Kingdom of Saudi Arabia: a Cross-sectional study, *Frontiers in Public Health*", 8. https://doi.org/10.3389/fpubh.2020.00217.

[31] Zhong, B.L., Luo, W., Li, H.M., Zhang, Q.Q., Liu, X.G., & Li, W.T. (2020). "Knowledge, Attitude and Practice Towards COVID-19 among Chinese residents during the rapid rise period of the COVID-19 outbreak: A quick online cross-sectional survey", *International Journal of Biological Sciences*, 16 (10), 1745.

[32] Belete, Z.W., Berihun, G., Keleb, A., Ademas,A., Berhanu, L., Abebe, M.,…Adane, M.(2020). "Knowledge, attitude, and preventive practices towards COVID-19 and associated factors among adult hospital visitors in South Gondar Zone Hospitals, Northwest Ethiopia", *PLoS One*, 16(5). https://doi: 10.1371/journal.pone.0250145.

[33] Pinchoff, J., Santhya, K.G., White, C.,Rampal, S., Acharya, R., & Ngo, D.T. (2020). "Gender specific differences in COVID-19 Knowledge, Behaviour and Health effects among adolescents and young adults in Uttar Pradesh and Bihar, India", *PLoS One*, 15(12). https://doi.org/10.1371/journal.pone.0244053.

[34] Ngwewondo A., Nkengazong, L., Ambe, L.A., Ebogo, J.T., Mba, F.M., Goni, H.O.,…Oyono, J. (2020). "Knowledge, Attitudes and Practices of/towards COVID-19 Preventive measures and symptoms: A cross-sectional study during exponential rise of the outbreak in Cameroon", *PLoS Negl Trop Dis*, 14(9). https://doi.org/10.1371/journal.pntd.0008700.