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Gender differences in knowledge about COVID-19 among youth in post-secondary education and training institutions in South Africa

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ABSTRACT

Evidence shows that improved understanding of knowledge about COVID-19 transmission, symptoms, and prevention is crucial for effective epidemic preparedness and management. Given gender differences in vulnerability and the different ways that young people responded to the pandemic, this paper investigated gender differences in COVID-19-related knowledge among youth in post-secondary education and training institutions in South Africa. Data from 6,681 respondents showed that the youth correctly answered 65.1% questions about COVID-19. The respondents' overall knowledge of COVID-19 transmission (82.6%) and preventive practices (75.6%) was relatively high, compared to their knowledge about symptoms (57.5%). Females (65.8%) were marginally more knowledgeable than males (64.3%), and the difference was statistically significant ($p = 0.021$). The knowledge levels differed by gender, with females more knowledgeable about COVID-19 than males. The findings suggest that information and awareness campaigns aimed at improving public health knowledge should be tailored, taking gender, age, and other socio-demographic variables into consideration.

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COVID-19; knowledge; gender; youth; South Africa

Introduction

Interventions that required behavioural changes among the population were implemented during the 2019 coronavirus disease (COVID-19) pandemic to limit its spread. The interventions that were introduced in South Africa and across many countries included restricting movement and social gatherings, wearing of masks, coughing with mouth covered with the elbow, hand washing using water and soap, sanitizers and physical distancing (National Institute for Communicable Diseases [NICD], 2020). The success of these public health and behavioural interventions depended on the extent to which the people complied with the prescribed measures (Galasso et al., 2020; Patway et al., 2022). Given that these restrictions were disruptive to the normal daily routines of people and had significant social, economic and psychological impacts (Lundström, 2022), several factors shaped the level of compliance with these behavioural prescriptions across different demographic and socio-economic groups (Anaam & Alshali, 2023; Anson & Eritsyanyan, 2023; Brooks et al., 2020; Galasso et al., 2020; Lin et al., 2021).

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Evidence has shown that people's awareness and knowledge about the pandemic's transmission, symptoms and preventive practices affected their compliance decisions (Carvalho Alves et al., 2021; Karijo et al., 2021; Lee et al., 2021; Riazi et al., 2023). A key finding from several studies (e.g. Anaam & Alsaahli, 2023; Brooks et al., 2020; Ferrín, 2022; Galasso et al., 2020) was that women were more likely to comply with the prescribed measures compared to men because they were more knowledgeable about COVID-19. This evidence is aligned with studies across disciplines that have found that women tend to seek and obtain health-related information, and thus are often more knowledgeable about health issues compared to men (Ek, 2013; Ferrín, 2022; Manierre, 2015). Women are more motivated to search for health information due to their roles as frontline health workers (where they often dominate), and care providers for sick family members (Ferrín, 2022; Manierre, 2015). The healthcare sector is highly feminized (Shannon et al., 2019), with 70% of health workers globally being women (Ferrín, 2022; Lotta et al., 2021). Women are expected to look after the sick and provide care support in the family and the community during funerals as part of their reproductive function (Ferrín, 2022; Manierre, 2015). Given the amount of time women spend as nurturers and care providers, they tend to be more concerned about health issues, leading to them asking more questions and seeking out more health information than men (Manierre, 2015). A review by Manierre (2015) found that women were 10–20% more likely than men to search for health information, and no studies among those reviewed had found that men were more likely to search for health information than women.

In the context of COVID-19, however, there is no consensus, as some studies (e.g. Hossain et al., 2020; Pinchoff et al., 2020; Stephen et al., 2023) found that females had lower COVID-19 knowledge levels than males. According to these studies, this was because men had more social interactions and better access to information, education, and media. Men are generally less risk-averse than women due to gender stereotypes and masculine norms that socialize men to be strong and think of themselves as not vulnerable, while the opposite is true for women (Ferrín, 2022; Manierre, 2015; Prentice & Carranza, 2002). As such, men interacted more during COVID-19 and gained more information and knowledge through these interactions about various dimensions of the pandemic (Hossain et al., 2020).

Given these mixed results, this study used nationally representative data to investigate the gender differences in knowledge about COVID-19 symptoms, transmission and practices among youth in post-secondary education and training (PSET) institutions in South Africa during the lockdowns between June and September 2020. This period coincided with the first peak of COVID-19 infections in South Africa (Gray, 2021). The PSET institutions include institutions for further education and training colleges focused on vocational education and training, private education providers at colleges and universities, skills development sector, and the regulatory and quality assurance sector (Dukhi et al., 2024). This study focused on youth in PSET institutions in South Africa because they were largely ignored for interventions, despite being also vulnerable. Beliefs about a group's vulnerability is crucial in informing their adoption of the suggested preventive practices (Anaam & Alsaahli, 2023; Galasso et al., 2020). The messaging around COVID-19 earlier on put more emphasis on protecting the elderly and those living with co-morbidities as being more susceptible to severe illness and death (Cheng et al., 2021). The elderly and those with co-morbidities were thus prioritized and targeted for prevention interventions such as vaccines. While young people were often portrayed as major spreaders of the pandemic by popular media, they were not prioritized for interventions such as vaccines aimed at mitigating the COVID-19 pandemic (Cheng et al., 2021; Monod et al., 2021). This perpetuated a low self-perceived risk of infection, illness and death among the youth, which led to complacency about COVID-19 public health warnings, yet the youth were also susceptible to the novel coronavirus (Yang et al., 2020).

Several studies have been done to understand the knowledge about COVID-19 among populations across many countries (Carvalho Alves et al., 2021; Feleke et al., 2022; Karijo et al., 2021; Lee et al., 2021; Nwagbara et al., 2021). There is a growing list of studies that have focused on youth in tertiary institutions in other countries (e.g. Ahmed et al., 2023; Anaam & Alsaahli, 2023; Angelo et al., 2021; Banik et al., 2023; Hatabu et al., 2020; Patwary et al., 2022; Peng et al., 2020; Shallie & Haffejee,

2022; Wu & Munthali, 2021). Studies on gender differences in the knowledge about COVID-19 are limited and have produced mixed results (Anaam & Alshali, 2023; Galasso et al., 2020; Stephen et al., 2023).

This study seeks to contribute to the literature in two main ways. First, the study seeks to add to the existing evidence by presenting the experiences of South African youth. Although evidence from previous studies in the developed countries and different settings is on an upward trend, this paper contributes to the existing body of evidence-based research on gender differences in knowledge about COVID-19 and other pandemic diseases by highlighting the experiences and the voices of global south PSET youth, particularly those from sub-Saharan African countries. Given the importance of socio-economic and cultural realities in shaping people's information search motivations, it is important that evidence be presented from different contexts. Yet, studies on knowledge, about COVID-19, and the extent of the gender differences of that knowledge, remain scarce in South Africa. For example, a 2021 scoping review on the subject in sub-Saharan African countries, which reported studies conducted between December 2019 and October 2020, did not cite any available studies for South Africa (Nwagbara et al., 2021). Reddy et al (2020) found that knowledge of symptoms, transmission and prevention measures was high in the general population in South Africa, and this varied by sex with females being more knowledgeable than their male counterparts. However, lower levels of both knowledge and risk perception were found among young people aged 18–29 years as well as students in that national survey, compared to other age groups and employment status. To our knowledge, our paper is the first available study of South African PSET students' COVID-19 knowledge using nationally generalizable data which were gathered at a critical juncture in the country's epidemic trajectory.

Second, while previous studies on youth's knowledge about COVID or gender differences of that knowledge have relied small and unrepresentative samples (e.g. Ahmed et al., 2023; Anaam & Alshali, 2023; Patwary et al., 2022), this paper uses nationally generalizable data. The findings of this paper are representative of youth in PSET institutions in South Africa. It is important to delve into the knowledge of COVID-19 among young people in South Africa to inform policies and guide interventions to reduce health inequities, improve future pandemic preparedness, and promote resilience in educational settings locally and within the sub-Saharan African region.

Methods

Study design and data collection procedure

Data was obtained from an online cross-sectional survey conducted between 18 June and 18 September 2020, coinciding with the first peak of COVID-19 infections in South Africa (Gray, 2021). The targeted participants were youth aged 18–35 years who were attending PSET institutions across the country. The survey was distributed widely through stakeholders, media, and other platforms. Networks of key actors and strategic partners in government (e.g. youth organizations, civil society organizations, national youth development agency, government departments, etc.) and higher education institutions (e.g. universities and colleges) were used to disseminate the invitation for youth to participate in the survey. These partners amplified circulation of the invitation through both mainstream media (radio and television) and social media platforms (Twitter and Facebook). Furthermore, two geo-targeted bulk SMS campaigns were implemented across the nine provinces.

The data collected included the knowledge, attitudes and practices of youth regarding COVID-19, information sources, and the perceived effect of COVID-19 on education and learning. More details on the sampling procedure can be found in Dukhi et al. (2024), which analysed the same data to investigate the impact of COVID-19 on learning and institutional support. After data processing and cleaning the study sample consisted of 6,810 young people aged 18 to 35 years. This analysis relied on a sub-sample of 6,681 respondents who completed all the key questions. To ensure the generalizability to the national population of PSET youth, estimates were benchmarked and weighted using

Statistics South Africa (Stats SA)'s mid-year estimates of the youth population aged 18–35 years who are attending PSET institutions by sex, population group, age and province (Statistics South Africa, 2019). The Study protocol was approved by the Human Sciences Research Council (HSRC) Research Ethics Committee (approval protocol number: REC 5/03/20). Informed consent was obtained from all participants prior to the survey interviews.

Measures

Dependent variables

Respondents' knowledge of COVID-19 was assessed using a set of 19 questions which covered transmission (4 questions), symptoms (9 questions) and preventive measures (6 questions). Knowledge levels were captured by the frequencies of correct answers to the knowledge-related questions. As in previous studies (e.g. Anaam & Alshali, 2023; Lee et al., 2021; Patwary et al., 2022), the knowledge scores were generated by assigning one point to each correctly answered question (correctly identified mode of transmission, symptoms, prevention practices). Incorrect answers were assigned zero. Aggregate scores were calculated for knowledge on transmission (range 0–4), symptoms (0–9) and preventive measures (0–6), with higher scores indicating better knowledge for each measure. An overall average knowledge index was calculated by merging the three scores (0–19) and dividing by the number of questions ($n = 19$).

Independent variables

For gender, the main explanatory variable, the survey questionnaire asked respondents if they subscribed to any of the following groups: male or female or prefer not to say. Those who preferred to not say had a very low response rate therefore they were excluded for further analysis. The other variables that influence knowledge were included in the models based on theory and previous studies. Age and racial group were included, as previous studies have shown the importance of these variables in knowledge search. Institutional type included Technical and Vocational Education and Training (TVET) colleges, general academic universities, universities of technology and private colleges. Location (City or suburb; Township; Informal settlement; Rural (tribal areas or farms). Additionally, information sources included television, radio, WhatsApp, other social media, websites, news, government sources, scientific journals, and family.

Statistical analysis

Data were analysed in Stata 18.0. Descriptive statistics (frequencies, means, chi-square tests) were used to summarize sample characteristics and to determine the levels of knowledge, attitudes and practices stratified by gender. Four multivariate linear regression models were fitted to investigate the factors associated with knowledge of 1) COVID-19 transmission, 2) symptoms, 3) preventive measures, and 4) overall knowledge, as follows:

$$Y_{ij} = \beta_0 + \beta_1 \text{Gender}_i + \beta_2 \text{Age}_i + \beta_3 \text{Race}_i + \beta_4 \text{Institutiontype}_i + \beta_5 \text{Location}_i + \beta_6 \text{Informationsources}_i + \beta_7 \text{Informationtrust}_i + u_i$$

Where: Y_i is the knowledge level of individual i , j represents one of the knowledge variables, β_0 is the regression intercept, β_i 's are the regression coefficients to be estimated; and u_i is the residual term.

Results

Sample characteristics

A sample of 6,681 respondents was analysed. The results presented in Table 1 show that 51.6% of the respondents were females, and most of the respondents were in the 21–24 years (42.8%) and 18–20

Table 1. Sample characteristics [$n = 6,681$].

Socio-demographic characteristics	Freq.	% [weighted]	95% CI	Males		Females		p-value
				%	95% CI	%	95% CI	
Gender								
Female	4,657	51.6	[50.1–53.1]					
Male	2,024	48.4	[46.9–49.9]					
Age		Mean = 22.0	[21.9–22.0]					
18–20	2,460	40.7	[39.2–42.1]	40.3	[37.9–42.9]	40.9	[39.3–42.6]	0.339
21–24	2,517	42.8	[41.3–44.3]	43.8	[41.3–46.3]	41.8	[40.2–43.4]	
25–29	1,291	11.4	[10.7–12.1]	10.7	[9.6–12.0]	12	[11.2–12.9]	
30–35	413	5.2	[4.6–5.8]	5.1	[4.3–6.2]	5.2	[4.6–5.9]	
Race								
African	5279	80.5	[79.3–81.5]	81.5	[79.5–83.3]	79.5	[78.2–80.7]	0.015**
White	788	10.7	[9.9–11.6]	11.1	[9.7–12.7]	10.4	[9.5–11.4]	
Coloured	312	5.8	[5.2–6.6]	4.8	[3.8–6.1]	6.8	[6.0–7.7]	
Indian	302	3.0	[2.6–3.4]	2.6	[2.0–3.3]	3.3	[2.9–3.8]	
Institution type								
University	4460	62.5	[61.0–63.9]	58.1	[55.6–60.6]	66.5	[65.0–68.1]	<0.001***
University of Technology	906	14.4	[13.4–15.5]	16.9	[15.2–18.8]	12.1	[11.0–13.2]	
TVET college	746	14.7	[13.6–15.8]	16.1	[14.2–18.1]	13.4	[12.2–14.6]	
Private college or other	563	8.5	[7.7–9.3]	8.9	[7.6–10.4]	8	[7.2–9.0]	
Location								
City or suburb	2544	34.3	[33.0–35.7]	33.1	[30.9–35.5]	35.4	[33.9–36.9]	0.002***
Township	2422	33.9	[32.5–35.3]	32.3	[30.0–34.6]	35.4	[33.8–37.0]	
Informal settlement)	344	5.6	[5.0–6.4]	5.7	[4.6–7.1]	5.6	[4.8–6.4]	
Rural (tribal areas or farms)	1371	26.2	[24.8–27.5]	28.8	[26.5–31.2]	23.6	[22.2–25.1]	

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

years age groups (40.7%). Over four-fifths were Black Africans (80.5%), and 62.5% attended universities. More females than males attended universities, while the reverse is true for other institution types. About a third of the respondents stayed in townships (33.9%) or suburbs (34.3%), and 26.2% resided in rural areas.

Knowledge of COVID-19 transmission, symptoms and preventive measures

Table 2 shows that the respondents were moderately knowledgeable about COVID-19, answering correctly on average 65.1% of the 19 questions. The data suggest there were gender differences in COVID-19 knowledge levels. Females (65.8%) were marginally more knowledgeable than males (64.3%), and the difference was statistically significant ($p = 0.021$). The respondents' overall knowledge of COVID-19 transmission (82.6%) and preventive practices (75.6%) was relatively high, compared to their knowledge about symptoms (57.5%).

Females were more knowledgeable than males about symptoms and preventive measures, whereas there was no significant difference by gender in the overall knowledge of COVID-19 transmission. Most respondents knew that COVID-19 can be transmitted through infected persons coughing or sneezing (88.4%) and touching faces after contact with infected persons (85.6%). Among the symptoms, shortness of breath (89.1%), coughing (84.4%) and fever (82.9%) were the commonly identified COVID-19 symptoms, followed by red-itchy eyes (19.1%), sweating (40.3%) and body pain (40.7%) were the least known symptoms. While regular hand washing (92.6%), using face masks (92.0%), staying at home during the lockdown (91.2%), and covering the mouths with an elbow when coughing (85.9%) were known by many as preventive measures. Overall, less than one third of respondents chose vaccination (30.8%) as a preventive measure. Notably more males (34.3%) than females (27.6%) PSET students chose vaccination (30.8%) as a preventive measure, and this was the only prevention practice where significantly more males outnumbered females.

Table 2. Knowledge of COVID-19 transmission, symptoms and preventive measures.

Variables	All		Male		Female		p-value
	%	95% CI	%	95% CI	%	95% CI	
Knowledge of COVID-19 transmission							
KT1: Infected persons coughing or sneezing	88.4	[87.4–89.3]	88.0	[86.2–89.6]	88.7	[87.6–89.8]	0.444
KT2: Public gathering where there is an infected person	78.3	[77.0–79.6]	76.7	[74.4–78.8]	79.9	[78.5–81.2]	0.001***
KT3: Touching virus-contaminated surfaces	78.2	[77.0–79.4]	78.8	[76.6–80.8]	77.7	[76.3–79.1]	0.424
KT4: Touching face after contact with infected person	85.6	[84.5–86.7]	84.4	[82.4–86.2]	86.7	[85.6–87.8]	0.032**
KT Average score (0–4)	3.3	[3.2–3.3]	3.3	[3.2–3.3]	3.3	[3.3–3.4]	0.163
KT overall percent	82.6	[81.7–83.5]	82.0	[80.4–83.5]	83.3	[82.3–84.2]	0.163
Knowledge of COVID-19 symptoms							
KS1: Body pain	40.7	[39.3–42.2]	38.6	[36.2–41.1]	42.7	[41.1–44.3]	0.007***
KS2: Sweating	40.3	[38.9–41.8]	39	[36.6–41.5]	41.6	[40.0–43.2]	0.085*
KS3: Shortness of breath	89.1	[88.1–90.0]	87.2	[85.4–88.9]	90.9	[89.9–91.8]	0.000***
KS4: Headaches	61.0	[59.5–62.4]	58.2	[55.7–60.7]	63.5	[61.9–65.1]	0.000***
KS5: Cough	84.4	[83.2–85.4]	84	[82.0–85.8]	84.7	[83.5–85.9]	0.527
KS6: Running nose	42.0	[40.6–43.5]	40.5	[38.0–42.9]	43.5	[41.9–45.1]	0.045**
KS7: Sneezing	57.5	[56.0–58.9]	55.9	[53.4–58.4]	58.9	[57.3–60.5]	0.049**
KS8: Red-itchy eyes	19.9	[18.7–21.1]	19.4	[17.5–21.5]	20.3	[19.0–21.6]	0.498
KS9: Fever	82.9	[81.7–84.0]	82	[79.9–83.9]	83.7	[82.5–84.9]	0.137
KS Average score (0–9)	5.2	[5.1–5.2]	5.0	[4.9–5.2]	5.3	[5.2–5.4]	0.001***
KS overall percent correct	57.5	[56.7–58.3]	56.1	[54.7–57.7]	58.9	[58.0–59.7]	0.001***
Knowledge of COVID-19 prevention practices							
KP1: Covering your mouth with a flexed elbow when coughing	85.9	[84.8–87.0]	84.9	[83.0–86.7]	86.9	[85.7–88.0]	0.071*
KP2: Staying at home during the lockdown	91.2	[90.3–92.1]	91.1	[89.6–92.5]	91.3	[90.3–92.2]	0.852
KP3: Using gloves	60.8	[59.4–62.3]	60.9	[58.5–63.4]	60.8	[59.1–62.4]	0.911
KP4: Using face masks	92.0	[91.1–92.8]	91.3	[89.7–92.6]	92.6	[91.7–93.5]	0.110
KP5: Washing your hands regularly for 20 seconds	92.6	[91.7–93.4]	91.2	[89.6–92.6]	93.9	[93.0–94.7]	0.001***
KP6: Obtaining a vaccine	30.8	[29.5–32.2]	34.3	[31.9–36.7]	27.6	[26.1–29.1]	0.000***
Average score (0–6)	4.5	[4.5–4.6]	4.5	[4.5–4.6]	4.5	[4.5–4.6]	0.869
KP overall percent	75.6	[74.9–76.3]	75.6	[74.4–76.9]	75.5	[74.8–76.3]	0.869
Overall average knowledge score (0–19)	13.0	[12.9–13.1]	12.9	[12.6–13.1]	13.2	[13.0–13.3]	0.021**
Overall knowledge percent	65.1	[67.9–69.1]	64.3	[63.2–65.4]	65.8	[65.2–66.4]	0.021**
Information sources about COVID-19							
INFO1: Television	65.3	[63.9–66.7]	63.3	[60.8–65.7]	67.2	[65.7–68.8]	0.006***
INFO2: Radio	46.3	[44.8–47.7]	47.2	[44.7–49.7]	45.4	[43.8–47.0]	0.241
INFO3: Government	35.9	[34.5–37.4]	36.1	[33.7–38.5]	35.8	[34.2–37.4]	0.849
INFO4: Newspapers/websites	55.0	[53.5–56.5]	57.7	[55.2–60.1]	52.5	[50.9–54.1]	0.001***
INFO5: Social media	12.3	[11.3–13.3]	14.5	[12.8–16.4]	10.2	[9.2–11.2]	<0.001***
INFO6: WhatsApp/email/SMS/other mobile apps	47.2	[45.7–48.7]	48.5	[46.0–51.0]	46	[44.3–47.6]	0.103
INFO7: Family	39.4	[37.9–40.8]	39.8	[37.4–42.3]	39	[37.4–40.6]	0.553
INFO8: Scientific journal	11.6	[10.7–12.6]	15	[13.4–16.9]	8.3	[7.5–9.3]	<0.001***
Information trust index	34.8	[34.6–35.1]	34.3	[33.9–34.8]	35.3	[35.0–35.6]	<0.001***

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

The respondents relied on various sources of information about COVID-19. The main sources of information about COVID-19 were television (65.3%) and newspapers (print and online) (55.0%). Government sources were used by 35.9%, while very few relied on social media (12.3%) as a source of information about COVID-19. More males than females used seven of the provided information sources. The exception was that more than two thirds of females (67.2%,) watched television compared to 63.3% of males. Overall, females (35.3%) had higher levels of trust in the various sources of knowledge.

Determinants of knowledge about COVID-19 among youth

Table 3 presents the socio-demographic factors associated with levels of knowledge. Overall, females had significantly more knowledge than males, and specifically knowledge about COVID-19

Table 3. Factors associated with COVID-19 knowledge levels.

Variables	Transmission knowledge index	Symptoms knowledge index	Prevention knowledge index	Overall knowledge index
Gender (Male)				
Female	0.044 (0.036)	0.242*** (0.071)	-0.025 (0.041)	0.261** (0.120)
Age (25–30)				
Age (18–20)	0.003 (0.049)	-0.340*** (0.098)	-0.029 (0.054)	-0.366** (0.163)
Age (21–24)	-0.027 (0.048)	-0.302*** (0.097)	-0.077 (0.055)	-0.406** (0.163)
Age (30–35)	-0.072 (0.078)	-0.120 (0.151)	-0.119 (0.080)	-0.312 (0.247)
Race (African)				
White	0.287*** (0.055)	-0.017 (0.115)	-0.073 (0.068)	0.196 (0.177)
Coloured	0.172** (0.082)	0.141 (0.163)	0.132 (0.088)	0.445* (0.267)
Indian/Asian	0.291*** (0.060)	0.084 (0.158)	-0.018 (0.079)	0.357 (0.230)
Institution type (university)				
University of Technology	0.089* (0.051)	0.105 (0.099)	0.097* (0.055)	0.291* (0.163)
TVET college	-0.536*** (0.064)	-0.221* (0.122)	-0.533*** (0.075)	-1.289*** (0.221)
Private college	-0.073 (0.061)	0.185 (0.127)	-0.101 (0.074)	0.011 (0.199)
Location (urban)				
Township	-0.131*** (0.048)	-0.036 (0.095)	-0.006 (0.054)	-0.172 (0.161)
Informal	-0.246*** (0.093)	-0.193 (0.170)	-0.076 (0.110)	-0.515* (0.301)
Rural	-0.152*** (0.054)	-0.077 (0.106)	-0.044 (0.060)	-0.273 (0.179)
Information sources				
Television	0.282*** (0.041)	0.522*** (0.080)	0.378*** (0.048)	1.182*** (0.138)
Radio	0.006 (0.038)	0.314*** (0.074)	0.234*** (0.041)	0.553*** (0.123)
WhatsApp or SMS	0.061 (0.041)	0.275*** (0.081)	0.258*** (0.045)	0.566*** (0.135)
Social media	0.075 (0.056)	0.089 (0.115)	-0.031 (0.061)	0.133 (0.182)
Newspaper	0.264*** (0.036)	0.401*** (0.073)	0.301*** (0.041)	0.966*** (0.121)
Government	0.236*** (0.036)	0.424*** (0.072)	0.255*** (0.039)	0.915*** (0.117)
Family	0.113*** (0.038)	0.363*** (0.075)	0.172*** (0.041)	0.648*** (0.121)
Information trust index	-0.002 (0.003)	0.017*** (0.005)	0.012*** (0.003)	0.027*** (0.009)
Constant	2.976*** (0.113)	3.656*** (0.205)	3.840*** (0.088)	10.925*** (0.255)
Observations	6,675	6,675	6,675	6,675
F-value	21.0***	16.8***	23.2***	21.7***
R-squared	0.103	0.084	0.133	0.135

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

symptoms. However, there were no significant differences in COVID-19 transmission and prevention knowledge between males and females. Age was significantly and negatively correlated with overall knowledge levels. PSET students aged 18–20 and 21–24 years were less knowledgeable about COVID-19 transmission than their counterparts 25 years and older. Race was significantly associated

with knowledge about COVID-19 transmission, and other population groups (White, Coloured and Indian/Asian) were more knowledgeable than Black Africans. There were no significant differences in knowledge about symptoms, preventive practices and overall knowledge levels by race. Students attending universities of technology were more knowledgeable about COVID-19 transmission and preventive measures than their counterparts in universities, while TVET college students were less knowledgeable than those in universities.

Knowledge levels about transmission significantly differed by locality type, while there were no significant differences in the knowledge about symptoms and preventive measures by locality type. Students from cities or suburbs were more knowledgeable about COVID-19 transmission than those in townships, informal settlements, and rural areas. Reliance on television, news, government sources and family was associated with higher levels of knowledge about COVID-19 transmission, symptoms, and preventive measures. Information from radio was correlated with increases in knowledge about symptoms and preventive practices, and not with knowledge about transmission. Higher levels of trust in information sources were associated with increasing levels of knowledge.

Discussion

This paper investigated the extent to which the knowledge about COVID-19 transmission, symptoms and practices vary by gender among the youth in PSET institutions in South Africa. To our knowledge, this is the first available study of South African PSET students' COVID-19 knowledge using nationally generalizable data which were gathered at a critical juncture in the country's epidemic trajectory. This nationally representative sample of youth in PSET institutions in South Africa has shown that their knowledge about COVID-19 in 2020 was overall moderate. Whereas their knowledge of COVID-19 transmission and preventive practices was relatively high, their knowledge about symptoms was quite low. The results are consistent with previous studies in South Africa and other similar developing countries (e.g. Kim et al 2021), which showed that the public was moderately knowledgeable about COVID-19. However, the percentages are lower than those reported by previous studies in South Africa (e.g. Reddy et al., 2020), and other countries (e.g. Anaam & Alsahali, 2023; Azlan et al., 2020; Karijo et al., 2021; Peng et al., 2020; Tawalbeh et al., 2021). There were moderate to low levels of knowledge among PSET youth. On average, the overall knowledge levels were marginally lower than the in general population in the country. This could be reflective of the novelty and ambiguity surrounding COVID-19 at the time, including a plethora of diverse information and misinformation circulating on social media frequented mostly by the youth. Alternatively, this might indicate that the knowledge-sharing approaches that were adopted were not appealing to the youth in PSET institutions, particularly among TVET students. Our findings show that TVET students had lower scores than their counterparts in other PSET institutions for transmission, symptoms, prevention and overall knowledge about COVID-19 as well as for practices.

Consistent with other previous studies, females were more knowledgeable than males about symptoms and preventive measures (Anaam & Alsahali, 2023; Lee et al., 2021). However, there was no significant gender differences in the overall knowledge of COVID-19 transmission. Stephen et al. (2023) found that males had higher knowledge levels than females in place and study year. This study found youth under the age of 25 years to be less knowledgeable about COVID-19. This is also consistent with the South African study by Reddy et al. (2020), that highlighted participants aged 18–29 years, those residing in informal dwellings, Black African and were male, had relatively lower COVID-19 knowledge levels. Younger aged youth were at the beginning of their studies and more likely to be dealing with the pressures of the transition from High school to university as well as coping with virtual learning than being fully informed about the virus. Poor COVID-19 knowledge attainment could also be attributed to lower exposure to government information and advertising pertaining to COVID-19, as well as seeking information from doctors and reliable sources, with most youth reliant on social media and the internet, where false and misinformation were widespread

(Dukhi et al., 2021; Sultana et al., 2022). This highlights the need for evaluation of information sources to ensure authenticity as well as contextual relevance.

While some studies (e.g. Kaiser et al., 2021; Stefánsdóttir et al., 2024) have reported that young people were more reliant on the internet and online news, our results show that the youth relied on a diverse range of information sources, including traditional media and social media sources. Females were more likely than males to depend on television, whereas males were more likely than females to rely on newspapers/websites, social media, and scientific journals. Access to information was correlated with higher levels of knowledge about COVID-19 transmission, symptoms, and preventive measures. The different information sources were associated with varying levels of increase in knowledge on COVID-19. Information from social media was not associated with increased knowledge of COVID-19 transmission, symptoms or preventive interventions. Access to information from the radio was significantly associated with increased knowledge on COVID-19 symptoms and preventive practices, but not with transmission. Access to information from sources such as television, government, family, and newspapers was associated with increased knowledge on COVID-19 transmission, symptoms, and preventive practices, and increased chances of adopting preventive measures.

The current study found that knowledge of transmission differed by dwelling type with students located in cities or suburbs more knowledgeable about COVID-19 transmission compared to those in townships, informal settlements, and rural areas. South African PSET students from informal locality types exhibited lower overall COVID-19 knowledge, whilst students from both township and informal locality types had a higher risk perception of contracting COVID-19. This may have been due to the fact that most households in these areas face overcrowding and poor living conditions which have made protocols such as social distancing and isolation to be almost impossible.

It has been established that rural and informal areas are often not reached by public health services, prevention, and awareness campaigns (Moeti et al., 2023; Willie & Maqbool, 2023). This situation is often exacerbated by the spatial design of most rural and informal dwellings which tends to not allow for adequate ventilation and on average these households contain five or more people in a small space, making self-quarantine or isolation not possible due to high-density within and outside the home (Dukhi et al., 2021). A study whose findings are consistent with ours reported that during pandemics, younger people, those with lower education levels and living in crowded spaces were more likely to go outside the home to socialize due to not having space within the home (Valodia & Francis, 2020). The differences observed by population group and dwelling type may be due to difference in awareness and knowledge about COVID-19 between Black Africans and other race groups. This could be due to the socio-economic inequalities prevalent in South Africa. Failure to adopt protective measures could also be attributed to the vast amount of misinformation that was common during the pandemic and therefore there is a need for targeted health education (Nour et al., 2015; Valodia & Francis, 2020). In the South African context, TVET colleges utilize work integrated experience and practical work as their medium of teaching and learning. During the pandemic, the shift from in person to virtual learning highlighted the divide of TVET colleges from other learning institutions due to their lack of internet, digital resources, and devices (Aina & Ogegbo, 2022). This shows the need for improving knowledge about epidemics among youth in general but especially among young people with low knowledge levels who may have challenges in access to correct information. This is important as epidemic control measures are affected by this and in dealing with pandemics public knowledge is a vital factor (Chirwa, 2020).

Conclusion

The study findings suggest that there were moderate levels of knowledge on the transmission, symptoms and practices of COVID-19 among youth in South Africa. The knowledge levels differed by gender, with females more knowledgeable than males. Although this finding has been affirmed by previous studies in the different contexts, the uniqueness of the current finding

is that it comes from generalizable data of the youth in university and college settings in a key country in sub-Saharan African. The contribution of this finding to the existing gender and knowledge research on pandemic diseases is that it allows the experiences and the voices of global south PSET youth to be heard. In addition, as alluded to in this study, studies on gender differences in the knowledge about COVID-19 are limited in post-secondary in sub-Saharan African countries. Therefore, the findings from this study are contributing a positive step towards this scientific knowledge and research gap. The study findings suggest the need for tailored information and awareness campaigns that take gender and other sociodemographic variables into consideration. The findings offer practical implications for the development of targeted interventions for the population rather than a one intervention fits all implementation. As new pandemics are predicted in the future, it is essential to develop pandemic information and preparedness, campaigns and education materials that are gender responsive.

This study had some limitations, key among them was the way the gender variable was asked. For instance, respondents were asked if they subscribed to any of the following groups: male or female or prefer not to say. Those who preferred to not say had a very low response rate therefore they were excluded for further analysis. For future surveys, it is recommended that survey specifically target those underrepresented youth categories to ensure that the voices and experiences of youth from all gender groups are highlighted and the policy interventions also include them.

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