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A CROSS-SECTIONAL STUDY OF TEENAGERS' COMPLIANCE WITH COVID-19 HEALTH PROTOCOLS: A STATISTICAL ANALYSIS

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ABSTRACT

The present cross-sectional study examines the attitude of 300 teenagers (13-18) aged in Talash, Dir Lower, Khyber Pakhtunkhwa, towards the effectiveness of COVID-19 Standard Operating Procedures (SOPs) adopted by the Government of Pakistan. Data were gathered via a self-administered questionnaire, the model of which was the Secondary Structure Survey Model of the World Health Organization, over a period of six months, using convenience sampling of different institutions. The respondents, 61% were male and 39% female, with the majority having Matric or FSc qualification. Results showed that only 17% of the teenagers supported SOPs carried out by the government, with 83% opposing them. Statistical results revealed that there was no significant relationship between gender and attitude towards SOPs, but there was a significant relationship between education level and SOP perception. Males rated higher than women in their perceptions of the COVID-19-related issues and internet usage. Such results outline an overall distrust of the measures against the pandemic in adolescents and the necessity to conduct specific awareness campaigns to enhance adherence and health outcomes among young people.

Keywords: *COVID-19, Public Health Awareness, Pandemic Measures, Cross-Sectional Study, Health Guidelines.*

1. Introduction

1.1 Background of Study

The outbreak of Coronavirus Disease 2019 (COVID-19) in Wuhan, China, quickly spread to other parts of the world, making it a global health crisis that was declared a pandemic by the World Health Organization (WHO) on March 11, 2020. Since its outbreak, COVID-19 has already infected hundreds of millions of people and killed millions of people across the globe. The incubation period of the virus is 5.1 on average and up to 14 days, which has played a vital role in identifying surveillance and containment measures (Lauer et al., 2020). At the beginning of

the pandemic, the health authorities suggested several non-pharmaceutical interventions (NPIs), including hand hygiene, respiratory etiquette, social distancing, remote work, school closures, and bans on large gatherings to curb transmission (Fauci et al., 2020; Flaxman et al., 2020). These measures were intended to decrease the basic reproduction number (R0), which is the average number of secondary infections caused by one person who has contracted the disease, by limiting physical contact, minimizing crowding, and having restrictions on travel and quarantine (Prem et al., 2020). The management of early outbreaks revolved around prevention strategies, such as early diagnosis, quarantine, isolation, and treatment. The WHO and national health authorities highlighted some important operational guidelines that included quarantining exposed people, preventing overcrowding, hand hygiene, physical distancing, and temporarily closing schools and workplaces (WHO, 2020a). Educational campaigns, such as posters, videos, and online outreach, were significant in creating awareness regarding preventive measures (Zhang et al., 2021). Nevertheless, the low compliance rate among the population in countries with a low level of compliance resulted in further transmission, which highlights the magnitude of behavioral adherence in the strategy to protect the population (Balmford et al., 2020). Lockdowns were instituted by many governments with serious socio-economic ramifications as they tried to contain the spread of the virus. COVID-19 had an enormous impact on Pakistan, with some provinces being more impacted than others. As of mid 2020, Punjab had the most cases, then Sindh and Khyber Pakhtunkhwa (KP). As of May 9, 2020, KP had recorded 4,327 confirmed cases, 221 deaths, and 1,033 recoveries (NCOC Pakistan, 2020). Pakistan introduced nationwide lockdowns, travel bans, the creation of quarantine zones, and a smart lockdown strategy (high-risk areas) to reduce the spread.

On July 20, 2020, the Ministry of National Health called on the strict observance of SOPs, social distancing, wearing masks, regular washing of hands, and no touching of faces, and began the multimedia social awareness campaigns. Measures of enforcement were fines and bans against violations of SOP. The provincial measures involved closing educational institutions, restricting market hours, and partial restrictions of the public spaces (NCOC Pakistan, 2020). Recent reports indicate that KP had behavioral variations in compliance, where rural regions were less compliant based on their inaccessibility to trusted health information and socio-cultural norms that oppose preventive behaviors (Ahmed et al., 2021; Rashid et al., 2022). COVID-19 has significantly affected the closure of educational institutions around the world, and specifically, school-aged children and teenagers. Nationwide closures resulted in canceled exams and academic disruptions, as well as a quick transition to online education (UNESCO, 2021). In Pakistan, the limited digital infrastructure and uneven access to the internet are major setbacks to successful online learning, especially in rural regions (Khan et al., 2021). Recent studies highlight the importance of developing pedagogical innovations that can help combat digital inequality, such as blended learning designs and training of teachers on digital delivery practices (Reimers and Schleicher, 2020). The educational technology and professional capacity building should be invested in order to protect the continuity of learning in the event of long-term disruption. The psychological effects of the pandemic have been immense, and adolescents have been especially susceptible because of emotional, social, and developmental aspects. Research indicates that lockdowns have intensified depression, anxiety, stress, and sleep disturbances in teens (Loades et al., 2020; Xie et al., 2021). The restrictions and social isolation during lockdown and uncertainty also led to an increase in psychological distress (Branquinho et al., 2020). Longer screen time, less physical activity, and disturbed habits have been associated with worse sleep quality and increased emotional issues in adolescents (Duan et al., 2020). Mental health issues that healthcare workers faced were exacerbated by the pandemic because of the stress at work and witnessing high mortality rates (Pappa et al., 2020). Long-term

psychological effects have been suggested to be addressed through mental health measures, including remote counseling services, community support programs, and school-based psychosocial support (Loades et al., 2020). Religious groups and communal events contributed to the dynamics of local transmission, especially in areas where mass events are a pivotal part of cultural and religious life (Ebrahim & Memish, 2020). Policies on public health instilled the suspension of big meetings and changes in religious activities to minimize the risk of transmission (Shirazi & Kazmi, 2021).

These changes underscored the importance of culturally sensitive health messages to enhance compliance among the different communities. Adherence to SOPs became central to the success of pandemic control. Research suggests that compliance with preventive measures is associated with socio-demographic characteristics, including the level of education, awareness, perceived risk, and confidence in government and health institutions (Bargain & Aminjonov, 2020; Chang et al., 2021). Pakistan-based research indicates that inconsistent compliance with hand hygiene was partly due to misinformation and low health literacy, especially in younger age groups (Ali et al., 2021). Social media was simultaneously useful and detrimental in both spreading necessary health information and spreading myths, which is why the WHO opened up myth-buster webpages to prevent the spread of misinformation (WHO, 2020b). The perception and adherence of adolescents towards SOPs is critical, as this age group contributes to the transmission in the community, given that they interact with others often and possess high mobility.SARS-CoV-2 virus, which has caused the COVID-19 pandemic, is a single-stranded RNA virus with spike proteins enabling effective human-to-human transmission. Its strong binding ability to ACE2 receptors has led to a rapid dissemination across the world, causing significant morbidity, mortality, and socio-economic disruption (Hoffmann, Kleine Weber, and Poehlmann, 2020; Walls et al., 2020). The most common methods of transmission include respiratory droplets, close contact, and contaminated surfaces, and the presence of asymptomatic carriers is also important (CDC, 2021; Prather, Wang, and Schooley, 2020). To curb the spread of the virus, countries all over the world introduced various types of non-pharmaceutical interventions (NPIs) in the form of lockdowns, quarantine, social distancing, closing schools, and even the education of people. Public compliance, healthcare infrastructure, and timely implementation of policies have affected the effectiveness of these measures (Hsiang et al., 2020; Chaudhry et al., 2020). Information provided by sources like the Corona Net dataset has helped researchers to examine the extent, implementation, and results of government policies (Hale et al., 2021).

In Pakistan, Khyber Pakhtunkhwa (KP) included, the government carried out extensive preventive and control measures to curb the spread of COVID-19. These were total nationwide lockdowns, smart (selective) lockdown measures, school closures, prohibition of social gatherings, mandatory use of masks, social distancing measures, and the rigid application of the Standard Operating Procedures (SOPs) in social places. Moreover, quarantine and isolation facilities were developed in various districts to treat suspected and confirmed cases, and travel bans were enforced on both internal and external transit to reduce the spread. The education of the citizens about COVID-19 symptoms, preventive measures, and the need to continue practicing hygiene habits, such as frequent handwashing and using sanitizers, was conducted through public awareness campaigns on television, radio, social media, and announcements in the community (Ali, Shah, and Iqbal, 2021; Ahmed, Khan, and Rehman, 2021; Government of Pakistan, However, despite these efforts, several problems that affected the effectiveness of government actions existed. The issues that Pakistan faced were extreme in terms of the absence of healthcare facilities, lack of hospital beds, ventilators, and lack of trained healthcare staff, particularly in rural and underdeveloped areas of KP. In addition, socio-economic factors significantly contributed to reducing the compliance of the population since a significant

percentage of people rely on daily wages and informal jobs, and it is challenging to comply with the lockdown in the long term. The second critical barrier was the misinformation and conspiracy theories that were high on the Internet and destabilized the confidence of the population and created misunderstandings about the severity of the disease and lack of compliance with preventive measures (Rashid, Noor, and Jamil, 2022; Salman et al., 2020; Khan et al., 2020). The youth (adolescents and teenagers) were reported to be inconsistent in adherence to COVID-19 SOPs, mainly due to their social lifestyle, peer pressure, perceived low risk, and the belief that young people were not at high risk of serious consequences. Many of the teenagers were inconsistent with wearing masks, not social distancing, and at social events. This implies that teenagers require increased culturally relevant, age-specific, and school-based educational programs, youth-friendly media content, and community engagement programs. To reinforce preventive behavior and promote responsible public health practices, effective communication that must be tailored according to adolescents is crucial (Reicher and Drury, 2021; Andrews et al., 2020; Zaidi et al., 2022).

As the introduction of COVID-19 vaccines took place, the meaning of prevention strategies changed to the need to rely on the non-pharmaceutical intervention methods (NPIs) and on the combined strategy of vaccination programs and the current preventive SOPs. Mass vaccination started in Pakistan through the National Command and Operation Centre (NCOC), with the focus being on healthcare professionals, older demographics, and subsequently extending vaccination to younger age groups. However, the uptake of vaccines was not uniform as there was vaccine hesitancy, lack of awareness, fear of side effects, religious misconceptions, and lack of trust in government institutions. The studies emphasize that health literacy, perceived risk of infection, perceived benefits of vaccination, and trust in health authorities are key determinants of vaccination acceptance and SOPs compliance (Troiano and Nardi, 2021; Lazarus et al., 2021; Zaidi et al., 2022). The COVID-19 pandemic made it quite evident that a coherent and unified approach to the public health response, a combination of evidence-based approaches, open communication, involvement of the population, and constant monitoring, is vital. Close coordination among government agencies, health care systems, education, and community leadership is required to ensure adherence and readiness to deal with future outbreaks of epidemics. Finally, enhancing community-level engagement, ensuring accurate information, improving healthcare capacity, and increasing public trust should be the key measures to prevent the impact of the COVID-19 pandemic and be less vulnerable to other pandemics (WHO, 2021; WHO Pakistan, 2021; NCOC, 2021; World Bank, 2021).

2. Methodology

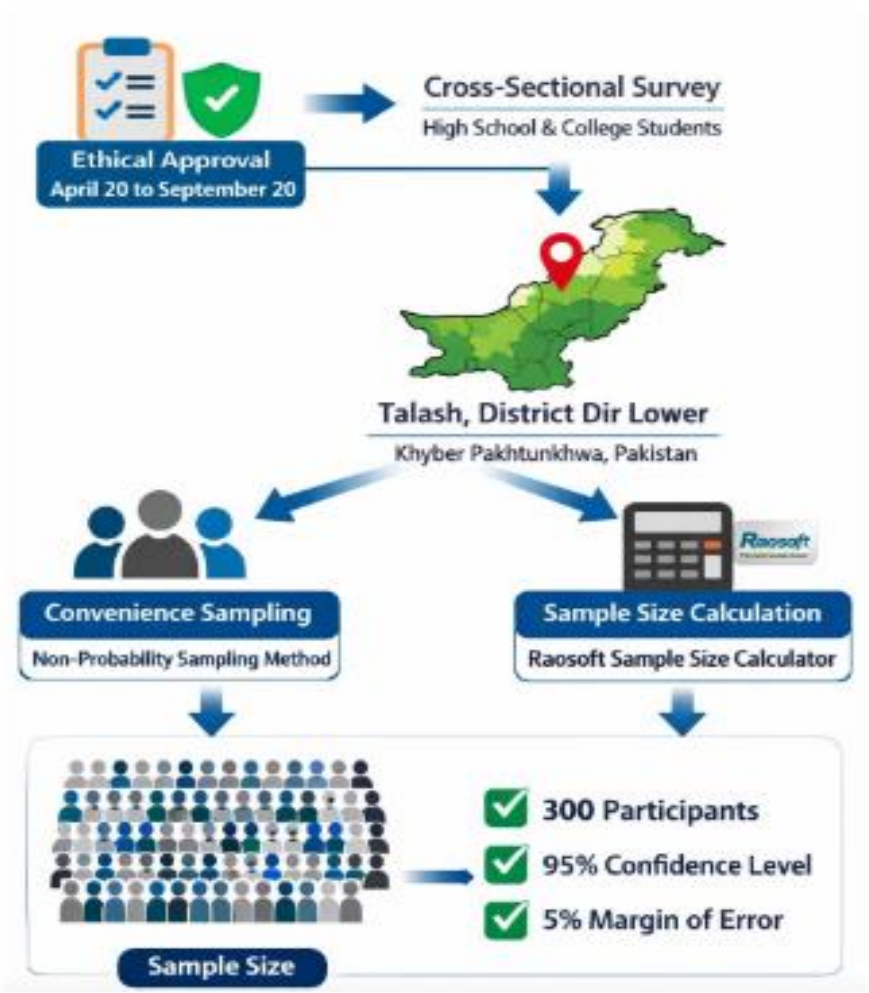
Inclusion criteria included students aged 13–19 years who voluntarily agreed to participate, while those unwilling were excluded. The questionnaire was pre-tested to ensure clarity and reliability before final data collection. Data were coded and analyzed using SPSS by applying descriptive statistics and chi-square tests to examine associations.

2.1 Study Design

The survey design used in this study was cross-sectional with a time frame of April 20 to September 20. Ethical approval was obtained from the concerned Institutional Review Board (IRB) before the data collection, and all the procedures were followed in strict adherence to the national and institutional ethical standards. To guarantee the participant's confidentiality, anonymity, and voluntary participation, full precautions were adopted to ensure that the respondents were informed of the study purpose before data collection. The participants in the research were recruited through a non-probability convenience sampling method among the high school and college students in the general population of Talash, District Dir Lower, Khyber Pakhtunkhwa, Pakistan. The sampling technique was used because of the accessibility and practicability of the technique, which enabled

effective data collection within the available time and resources. The sample size was calculated with the help of the Raosoft sample size calculator and was 300 subjects. The analysis has been done under the 95% confidence level and the 5 percent margin of error, which is generally accepted in the research of social and health sciences. This was deemed sufficient to enhance the study findings in terms of statistical validity, reliability, and generalizability. In general, the study design and sample plan were well-designed to guarantee the methodological rigor and feasibility in the field setting.

Figure 1. Study Design for the cross-sectional study



2.2 Data Collection Procedure

The primary data was gathered physically, through the visitation of the different high schools and colleges in Talash, District Dir Lower, Khyber Pakhtunkhwa. Strict observance of ethical guidelines ensured that there was a form of confidentiality and anonymity of the participants. The participants were completely aware of the purposes of the survey and signed an informed consent. They also told them that they had the right to answer no questions or drop out of the study without any repercussions. To increase the reliability of the data, the researchers gave clear guidelines, and they were available to clarify any suspicions in the course of the survey.

2.3 Data Collection Instrument

The structured survey was constructed according to the World Health Organization Secondary Structure Survey Model (SSSM). Subject-matter

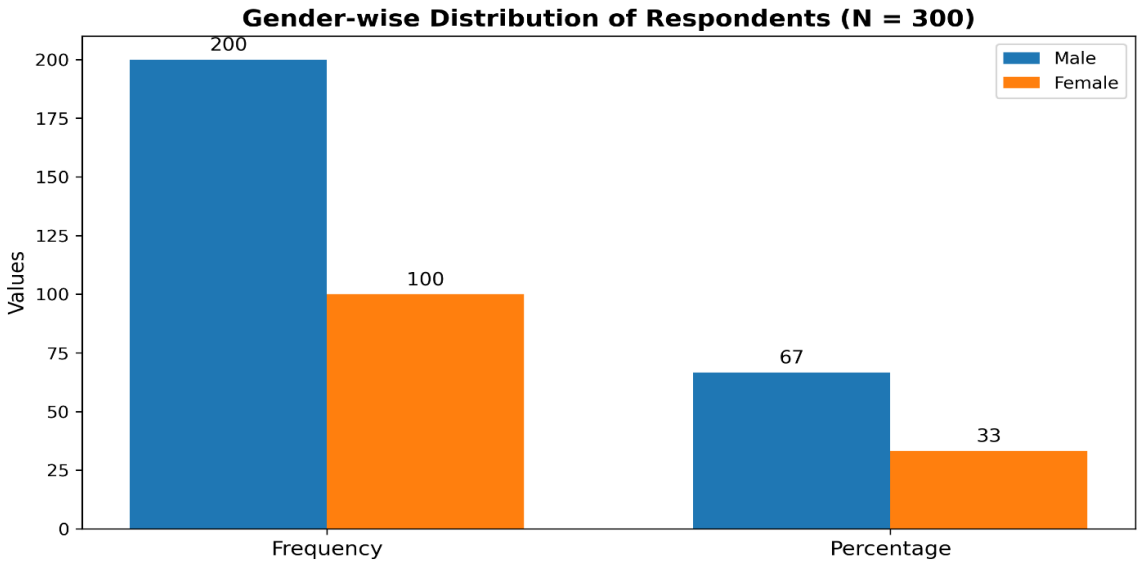
experts were involved to preview the instrument regarding content validity and readability. To determine the reliability and understanding of the survey, a pilot study was done on 35 students. Using the pilot findings, some slight alterations were made to complete the survey for the main study. The questionnaire had a section of demographic data, knowledge, and perceptions of COVID-19 SOPs, and behavioral compliance.

2.4 Statistical Analysis

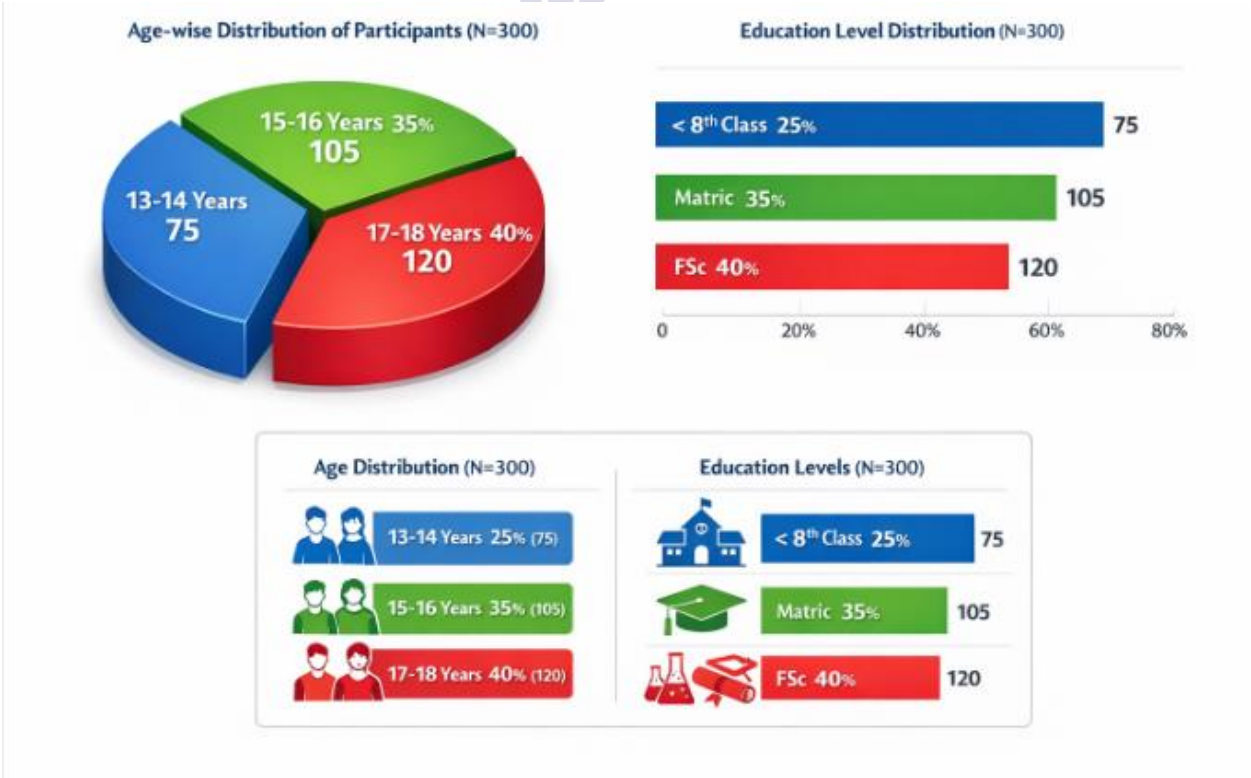
The data obtained were coded and input into SPSS version 30 and analyzed. Frequencies, percentages, means, and standard deviations were used to describe characteristics and responses of the participants with the help of descriptive statistics. To test the relationship between demographic factors (ex, gender, educational level) and perceptions or adherence to COVID-19 SOPs, inferential statistics (Chi-square tests, t-tests) were conducted. The statistical significance was considered at $p < 0.05$. Findings were presented in clear and interpretable ways in the form of visualizations, such as bar charts and pie charts.

3. RESULTS AND DISCUSSION

The data gathered were computed using the Statistical Package of Social Sciences (SPSS). To present the demographic characteristics and the main variables of the study in a clear and understandable form, descriptive statistical methods such as frequencies and percentages were used to summarize and present the data. The questionnaire was further divided into two major parts: attitudes towards the health protocols related to COVID-19 and perceptions about the preventive measures. In the attitude part, the responses of the respondents were classified in a scoring system. The scores that were used to determine the positive attitude were between 13 and 17, as they showed greater acceptance and desire to adhere to COVID-19 health guidelines. On the other hand, the range of 1-12 was a negative attitude, which indicated unwillingness or lack of adherence to recommended preventive behaviors. This classification assisted in identifying participants in relation to their behavioral orientation to health guidelines. The section of perception included 20 structured items, which were aimed at measuring the degree of awareness and knowledge of the respondents on the use of preventive measures against COVID-19. There was a set point that a score of above 15 was taken as sufficient perception, which meant that the individual had enough awareness and knowledge of safety measures. A score of at least below this cutoff was taken to mean limited or inadequate perception, or gaps in knowledge or awareness. In order to achieve reliability and internal consistency of the questionnaire, a pilot study was carried out before the main survey. Analysis of reliability gave a Cronbach's alpha of 0.79, which can be considered as an acceptable measure of internal consistency, and it was acceptable that the instrument was appropriate in collecting data in the main study. Additionally, gender was also a significant socio-demographic variable to be analyzed. Gender is a socio-cultural construct, categorising people as males and females, and that is important in explaining the difference in health-related behaviours and attitudes. Table 1 shows a breakdown of the respondents based on gender. A total of 300 participants were included in the study. The data indicate that most of the respondents were males (60.70%), and 39.30% were females, which suggests that the participation of males in the study sample is relatively high. The importance of this distribution is that it can be used to interpret the findings because gender imbalance can affect the general trends of attitudes and perceptions towards COVID-19 health measures.



The age of respondents was categorized into three equal class intervals for better interpretation of the data. The analysis revealed that: Around 24.9% (n ≈ 75) of participants belonged to the 13–14 years age group. Approximately 38.5% (n ≈ 116) were in the 15–16 years age group. The highest proportion, about 39.8% (n ≈ 119), belonged to the 17–18 years age group. These findings indicate that most of the respondents were older teenagers, particularly in the 17–18 years category.



The findings indicate that in the age structure, there are three groups of participants. The lowest percentage is between 13 and 14 years, which comprises 75 respondents (25%). Age group

1516 years is a mediocre proportion of 105 respondents (35%). The 1718-year group is the largest with 120 respondents (40 percent), implying that the majority of respondents are older teens. The same trend is followed in the distribution. The largest proportion of respondents had an education level of 8th class and below, totaling 75 respondents (25%). The group of Matric level respondents is 105 (35%), and the greatest number of respondents is the FSc level with 120 (40%) respondents. This indicates that the general level of education of most participants is still higher, and the number of those at the intermediate education level is higher. In general, the figure indicates that the sample is skewed toward older and better-educated teenagers, and this aspect might lead to a better comprehension and awareness of health-related topics, including COVID-19 SOPs.

Table 1: Descriptive Statistics Age-wise Distribution of Study Participants (N = 300)

Variables	Mean ± SD	Range
Mean Age	17.15 ± 0.79	13-18
Mean of Education	10.15 ± 0.79	8-12

Table 2: Descriptive Statistics Age Categories Distribution

S/N	Age Categories	Frequency	Percent (%)
1	13-14	75	25.0
2	15-16	105	35.0
3	17-18	120	40.0
Total		300	100.0

Table 3: Education Level Distribution Descriptive Statistics Age Categories Distribution

S/N	Education Level	Frequency	Percent (%)
1	< 8th Class	75	25.0
2	Matric	105	35.0
3	Fsc	120	40.0
Total		300	100.0

The educational background of the 300 respondents shows that a relatively larger proportion of participants were well educated. About 24.9% (n ≈ 75) of the respondents had education up to middle level (below 8th class), while 34.8% (n ≈ 104) had completed Matriculation. The highest proportion, 39.8% (n ≈ 119), had completed FSc level education. This distribution indicates that most of the participants belonged to the intermediate level group, suggesting a moderately educated sample population overall. Figure 3 presents the level of education among teenage participants. The cross-tabulation between gender and attitude toward COVID-19 SOPs revealed that a considerable number of respondents held negative attitudes toward SOP compliance. It was observed that males showed a higher tendency toward negative responses compared to females, indicating that males were relatively more likely to ignore or show less compliance with government SOPs. In contrast, females demonstrated comparatively better adherence and more positive attitudes toward COVID-19 preventive measures. However, the statistical analysis showed that this difference between males and females was not significant ($p > 0.05$), meaning that gender does not have a meaningful association with attitudes toward SOPs in this study. In contrast, the relationship between education level and attitudes toward SOPs showed a clear and significant pattern. The findings indicated that respondents with higher education levels were more likely to demonstrate positive attitudes toward government SOPs, whereas those with lower education levels showed more negative responses. The chi-square test

confirmed that this relationship is statistically significant (p = 0.003), suggesting that education plays an important role in influencing individuals' awareness, understanding, and compliance with public health guidelines.

Figure 2: Age Distribution of Participants (N = 300)

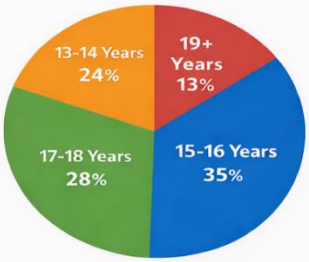


Figure 3: Level of Education of Teenagers (N = 300)

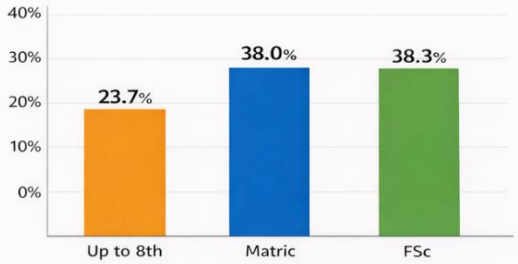


Figure 4: Gender Wise Attitude toward COVID-19 SOPs (N = 300)

Table 4: Chi-Square Tests

Statistics	x^2	DT	p-value
Pearson x^2 (r)	16.050[a]	2.0	3–1, 2–1) = 2
Ration	14.625		0.003
Linear relationship	12.648		

a. 2 cells (53.9%) have expected count less than 5.

Figure 5: Education Wise Attitude toward COVID-19 SOPs (N = 300)

- **Figure 3:** 300 participants in a COVID-19 SOPs atiitude study:
  - Age is distributed-as shown in Figure 2 with the largest group being 15-18 years (39%).
  - Education level as shown in **Figure 3**, with the majority at Matric (38.0%) and PSc (58.0%).
- **Gender-wise Conclusion (Figure 4):**
  - No significant association between genender and attitude towards COVID-19 SOPs:
    - Males: 174 Negative, 32. Positive
    - Females: 78 Negative, 16 Positive (x^1) = 0.14, p = 0.70, no significance)
- **Education-wise Conclusion (Figure 5):**
  - Significant association between education level and attitude towards COVID-19 SOPs:
    - x^2 (2) = 16.050, p = 0.003

3.1 Chi-Square Test

The chi-square test also confirmed the relationship between education and attitude towards SOPs. The Pearson chi-square indicated that there was a significant relationship between the variables, which asserted that education level has a significant influence on compliance behavior. The findings indicate that with an increase in education, there is also increased awareness and acceptance of government health measures.

Table Independent Sample t-test Results Mean Comparison of Perception of COVID-19 by Gender (N = 300)

Variables	Males (n=183) Mean	SD	Females (n=117) Mean	SD t (298)	95% CI (LL)	95% CI (UL)
Perception of COVID-19	119.01	6.82	4.71	6.15	2.80	5.90

Note: *p < .05, **p < .01

An independent samples t-test was used to compare males and females in terms of their perception of COVID-19 and the effectiveness of SOPs. The outcome showed that there was a statistically significant difference between the two groups t(298) = 4.86, p < 0.05. The average score of males was larger than that of females, which means that: Males had a relatively stronger

perception of COVID-19 and SOP effectiveness. The perception scores in females were slightly lower. This finding indicates that there are gender variations in the levels of perception, as males are more aware of or have more belief in preventive measures of COVID-19.

4. Conclusion

The findings of this study reveal that approximately 50% of Pakistani youth are well-informed about COVID-19; however, many still exhibit negative behaviors, such as reluctance to follow preventive measures. A significant portion of the youth population was hesitant to comply with the COVID-19 SOPs issued by the Government of Pakistan, indicating that awareness does not always translate into practice. This study further highlights a clear positive relationship between educational level and the acceptance of SOPs, showing that educated individuals are more likely to adopt health-conscious behavior. The results also identify critical gaps in knowledge and practices that must be addressed through future awareness and educational campaigns. Moreover, it was observed that many young individuals rely on less credible sources of information, which negatively affects their perceptions and practices regarding COVID-19. Therefore, the Ministry of Health needs to adopt a more integrated and inclusive approach that targets all segments of society, particularly the underprivileged, less educated, and adolescent groups. Such an approach will help ensure balanced access to accurate COVID-19 information and promote the effective implementation of preventive strategies. This study emphasizes the need to strengthen community-based health education programs to improve compliance and reduce misinformation.

Authorship Contribution Statement

Fayaz Ahmad: Conceptualization, Study design, Questionnaire development, Data collection supervision, Data curation, Methodology, Formal analysis, Interpretation of results, Writing – original draft, Writing – review & editing, Visualization.

Chongjian Wang: Conceptualization, Methodology, Statistical guidance, Validation of results, Writing – review & editing, Critical revision of the manuscript, Supervision, Project administration.

Muhammad Ismail: Data curation, Statistical analysis support, Software (SPSS/data entry), Visualization (tables/figures), Interpretation of findings, Writing – original draft, Writing – review & editing.

Muhammad Ilyas: Methodology, Data collection support, Formal analysis, Validation, Writing – review & editing, Proofreading, and formatting.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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