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Original Article

Attitudes and Behaviors Toward face Mask Use during the COVID-19 Pandemic: A Cross-Sectional Study from Punjab, Pakistan.

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Abstract

Background:
Face masks are a core non-pharmaceutical intervention to limit SARS-CoV-2 transmission, yet public attitudes and everyday practices vary widely. Understanding who wears masks, how they are worn, and why people comply or resist can inform targeted public health strategies.

Methodology:
A descriptive cross-sectional online survey was conducted between November 2020 and March 2021. Adults aged ≥18 years with at least secondary education were eligible. The questionnaire included demographics, COVID-19 history, attitudes, and behaviors. Reliability of Likert-type scales was acceptable (Cronbach's $\alpha = 0.78$). Descriptive statistics, t-tests, and chi-square tests were applied using SPSS v22, with effect sizes reported (Cohen's d, Cramer's V). A significance level of $p < 0.05$ was applied.

Results:
Of 495 respondents (201 males; 294 females), females reported higher regular mask use (85.0% vs. 66.7%, $p = 0.001$) and greater endorsement of correct wearing (covering nose, mouth, chin). Males more often reported barriers (e.g., "hassle," reduced confidence), skepticism about effectiveness, and improper wearing (e.g., mouth/chin only). Significant but small-to-moderate effects were observed across multiple items (typical $d \approx 0.2–0.36$; Cramer's V up to 0.39 for employment status).

Conclusion:
Clear gender differences exist in mask-related attitudes and behaviors. Tailored, gender-sensitive communication and low-cost access strategies may increase adherence, particularly among men. Findings can guide behaviorally informed interventions for future respiratory outbreaks.

Keywords:
COVID-19, Face Masks, Gender Differences, Public Health, Health Knowledge, Attitudes, Practice

Introduction

Coronavirus disease 2019 (COVID-19) emerged in Wuhan, China, in December 2019, initially presenting as pneumonia of unknown origin [1]. The World Health Organization (WHO) declared the outbreak a Public Health Emergency of International Concern on January 30, 2020, and subsequently classified it as a pandemic on March 11, 2020 [2]. Pakistan, sharing close travel and trade ties with China, reported its first confirmed case on February 26, 2020, in Karachi [3]. By April 17, 2020, more than 7,000 confirmed cases and 135 deaths had been recorded nationwide [4].

To curb transmission, Pakistan's Preparedness and Response Plan (PPRP) mandated face mask use in public spaces beginning May 31, 2020 [5]. Face masks, as part of a wider set of NPIs including physical distancing, ventilation, and hand hygiene, were recognized as essential tools to prevent widespread contagion [6].

Masks were shown to be protective during prior outbreaks, such as the 2003 SARS epidemic [7]. Their effectiveness varies by type: two-layered cotton masks offer about 35% protection, cloth masks with filter pockets up to 70%, surgical masks around 60%, and N95/KN95 respirators up to 95% [8,9]. However, Pakistan faced barriers to widespread compliance. These included low overall health literacy [10], gender gaps in literacy rates [11], discomfort such as skin irritation or breathlessness [12,13], and sudden price hikes during the first wave [14].

Gender-based patterns are particularly important. International data demonstrate that women are more likely to perceive COVID-19 as a serious health threat and to comply with preventive measures, including mask use [15,16]. Whether similar patterns exist in Pakistan, and how they manifest behaviorally, has not been systematically studied.

This study aimed to assess gender differences in attitudes and behaviors regarding mask use in Punjab, Pakistan. Specifically, it examined (i) demographic profiles and COVID-19 history, (ii) gender-based differences in mask-related attitudes, and (iii) behavioral practices such as correct mask placement, purchasing patterns, and disposal habits. The findings are intended to guide context-specific, gender-sensitive public health strategies for COVID-19 and future pandemics.

Methodology

Study Design

This was a descriptive, cross-sectional study conducted to evaluate the attitudes and behaviors of the general population towards the use of face masks during the COVID-19 pandemic. The study design allowed for the collection of data at a single point in time, enabling comparisons across demographic subgroups, particularly gender.

Ethics

Ethical approval for the study was obtained from the Human Ethical Committee, University College of Pharmacy, University of the Punjab, Lahore (Ref: HEC/PUCP/101/2020). Participation was entirely voluntary, and informed verbal and written consent was obtained from all respondents prior to data collection. Confidentiality and anonymity of participants were ensured throughout the process.

Setting

The study was conducted in the Punjab province of Pakistan over a period of five months (November 2020 to March 2021). Data were collected primarily through online platforms and social media applications due to movement restrictions and social distancing requirements during the pandemic.

Participants

A total of 495 individuals aged 18 years and above participated. The inclusion criteria required respondents to have at least secondary-level education, internet access, and willingness to provide consent. Individuals under 18 years of age, illiterate respondents, and those unwilling to participate were excluded. Non-probability convenience sampling was used, which, while practical during the pandemic, may limit generalizability. The calculated minimum sample size was 384 (95% confidence interval, 5% margin of error), but additional participants were included to strengthen statistical power and gender representation.

Variables

Key independent variables included demographic factors such as age, gender, marital status, education level, area of residence, and employment status. Dependent variables were attitudes, beliefs, and behaviors related to mask use, such as perceived effectiveness, willingness to wear masks, and adherence to mask-related practices.

Data Sources/Measurement

Data were collected via a structured online questionnaire consisting of four sections: (1) demographic information, (2) COVID-19 infection history, (3) attitudes towards mask use, and (4) behavioral practices regarding mask-wearing. Responses for attitudinal and behavioral sections were captured on a 5-point Likert scale (1 = strongly disagree to 5 = strongly agree). Reliability was confirmed with Cronbach's $\alpha = 0.78$ for the overall scale, indicating acceptable internal consistency. Validity was ensured through expert review, pilot testing (n=10), and clustering of items into meaningful subscales.

Bias

The study acknowledged potential sources of bias. Selection bias was present due to the reliance on online surveys, which favored participants with internet access and higher education levels, leading to over-representation of urban and literate populations. Social desirability bias may have influenced self-reported mask-wearing behavior. Efforts to reduce these biases included anonymous responses and assurance of confidentiality.

Study Size

The final sample size was 495 participants, which exceeded the minimum required (384) and ensured sufficient representation across male and female subgroups (over 200 respondents per group). This larger sample enhanced statistical power for subgroup analysis.

Quantitative Variables

Quantitative variables included age (continuous), attitude and behavior scores (Likert-scale mean scores), and frequency of mask usage (categorical). Qualitative variables such as marital status, employment, and area of residence were analyzed as categorical data.

Statistical Methods

Data analysis was performed using SPSS version 22. Descriptive statistics (frequencies, percentages, means, and standard deviations) were computed for all variables. Inferential statistics included independent samples t-tests for continuous variables and Pearson's chi-square tests for categorical variables. Effect sizes (Cohen's d, Cramer's V) were reported to assess the strength of associations. A p-value of <0.05 was considered statistically significant.

Results

Participants

A total of 495 individuals completed the survey, comprising 201 males and 294 females. All participants met the inclusion criteria of being 18 years or older with at least secondary-level education and internet access. The participation exceeded the minimum sample size requirement (n = 384), thereby enhancing the statistical reliability of subgroup analyses, particularly gender-based comparisons.

Descriptive Data

Baseline demographic characteristics are summarized in Table 1. The mean age of male participants was 24.92 ± 8.48 years, while for females it was 22.34 ± 4.83 years, showing a significant age difference ($p < 0.001$). Educational attainment was relatively high across both groups, with more than 80% reporting university-level education. Marital status differed significantly between groups, with a greater proportion of men being married (15.4%) compared to women (9.2%, $p = 0.035$). Employment status revealed marked differences, as 40.3% of men were employed compared to only 10.2% of women ($p < 0.001$). Most respondents resided in urban areas, with no significant gender difference observed.

Outcome Data

History of COVID-19 infection and mask-related practices are presented in Table 2. Previous or current infection was reported by 9.5% of males and 7.2% of females, while approximately one-fifth of participants indicated that a family member had contracted COVID-19. Regular mask use was significantly higher among females (85.0%) than males (66.7%, $p = 0.001$). Both genders predominantly used surgical masks (M = 81.1%, F = 84.6%), although a higher percentage of males purchased masks from street peddlers compared to females (8.5% vs. 3.8%, $p = 0.029$).

Main Results

Analysis of attitudes (Table 3) revealed clear gender differences. Males were more likely than females to believe that only symptomatic individuals or the elderly should wear masks ($p < 0.001$), while females consistently demonstrated stronger agreement with statements emphasizing the necessity of mask use in public and crowded places ($p < 0.001$). Females were also more likely to consider cloth masks effective, whereas males more often described mask-wearing as a hassle or expressed skepticism regarding effectiveness.

Behavioral findings (Table 4) further highlighted these differences. Males more frequently reported improper mask usage, such as covering only the mouth and chin, or wearing the dark side of the mask inward ($p < 0.01$). They were also more likely to express discomfort, reduced confidence, or the belief that a strong immune system negates the need for mask use ($p < 0.001$). In contrast, females reported higher adherence to recommended practices, including correct placement of the mask covering nose, mouth, and chin.

Table 1: Population Demographics.

Characteristic	Male (n = 201)	Female (n = 294)	Test & p-value	Effect size (95% CI)
Age (years), Mean ± SD	24.92 ± 8.48	22.34 ± 4.83	t(289) =3.90, p < 0.001	Cohen's d = 0.36, Mean diff = 2.58 [1.27, 3.89]
Education Level, n (%)				
– Secondary	9 (4.5%)	7 (2.4%)	χ^2 (2) = 3.79,	
– College	24 (11.9%)	24 (8.2%)	p = 0.150	Cramer's V = 0.07 (ns)
– University	168 (83.6%)	262 (89.4%)		
Marital Status, n (%)				
– Married	31 (15.4%)	27 (9.2%)	χ^2 (1) = 4.45,	Cramer's V = 0.09, Married: M 15.4%
– Unmarried	170 (84.6%)	266 (90.8%)	p = 0.035	[10.6–21.6], F 9.2% [6.2–13.0]
Area of Residence, n (%)				
– Urban	164 (81.6%)	253 (86.3%)	χ^2 (1) = 2.05,	Cramer's V = 0.06 (ns)
– Rural	37 (18.4%)	40 (13.7%)	p = 0.152	
Employment Status, n (%)				
– Unemployed	120 (59.7%)	263 (89.8%)	χ^2 (1) = 75.6,	Cramer's V = 0.39, Employed: M
– Employed	81 (40.3%)	30 (10.2%)	p < 0.001	40.3% [33.6–47.1], F 10.2% [6.6–14.4]

*$p < 0.05$, $p < 0.01$ indicate statistically significant differences.
Age was analyzed using the independent samples t-test: $t(289) = 3.90$, $p < 0.001$; categorical variables were analyzed using Pearson's Chi-square test.
Likert scale items (if applicable) are not shown in this table but should include anchors such:
1 = Strongly disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly agree.

Table 2: Previous history with COVID-19.

Characteristic	Male (n = 201)	Female (n = 294)	Test & p-value	Effect size (95% CI)
Previous/present infection with COVID-19			χ^2 (2) = 1.32, p = 0.517	Cramer's V = 0.05 (ns)
– Yes	19 (9.5%)	21 (7.2%)		Male 9.5% [6.0–14.5], Female 7.2% [4.7–10.8]
– No	158 (78.6%)	242 (82.6%)		Male 78.6% [72.3–83.9], Female 82.6% [77.9–86.6]
– Not sure	24 (11.9%)	30 (10.2%)		Male 11.9% [8.1–17.2], Female 10.2% [7.2–14.3]
Any family member infected			χ^2 (2) = 1.44, p = 0.488	Cramer's V = 0.05 (ns)
– Yes	38 (18.9%)	63 (21.5%)		Male 18.9% [14.0–25.0], Female 21.5% [17.2–26.5]
– No	144 (71.6%)	210 (71.7%)		Male 71.6% [65.1–77.3], Female 71.7% [66.2–76.6]
– In the past	19 (9.5%)	20 (6.8%)		Male 9.5% [6.0–14.5], Female 6.8% [4.4–10.4]
Wear face mask regularly			χ^2 (1) = 12.5, p = 0.001	Cramer's V = 0.17
– Yes	134 (66.7%)	249 (85.0%)		Male 66.7% [59.8–72.9], Female 85.0% [80.5–88.7]
– No	67 (33.3%)	44 (15.0%)		Male 33.3% [27.1–40.2], Female 15.0% [11.3–19.5]
Type of mask usually worn			χ^2 (3) = 5.75, p = 0.125	Cramer's V = 0.09 (ns)
– N95	21 (10.4%)	17 (5.8%)		Male 10.4% [6.7–15.6], Female 5.8% [3.6–9.0]
– Surgical mask	163 (81.1%)	248 (84.6%)		Male 81.1% [75.0–86.0], Female 84.6% [80.0–88.3]
– Cloth mask	12 (6.0%)	25 (8.5%)		Male 6.0% [3.4–10.3], Female 8.5% [5.8–12.2]
– Others	1 (0.5%)	1 (0.3%)		Male 0.5% [0.1–2.7], Female 0.3% [0.1–1.8]
Where masks are usually purchased			χ^2 (3) = 9.08, p = 0.029	Cramer's V = 0.13
– Pharmacy	154 (76.6%)	248 (84.6%)		Male 76.6% [70.2–82.0], Female 84.6% [80.0–88.3]
– Grocery store	22 (10.9%)	30 (10.2%)		Male 10.9% [7.2–16.1], Female 10.2% [7.2–14.3]
– Street peddlers	17 (8.5%)	11 (3.8%)		Male 8.5% [5.3–13.3], Female 3.8% [2.1–6.8]
– Brand store / Online	8 (4.0%)	4 (1.4%)		Male 4.0% [2.0–7.8], Female 1.4% [0.5–3.6]

*p < 0.05; **p < 0.01 indicate statistically significant differences.
All variables analyzed using Pearson's Chi-square test; effect size reported as Cramer's V.

Table 3. Attitudes towards wearing face mask.

Statement	Male (n = 201) Mean ± SD	Female (n = 294) Mean ± SD	t-test (p-value)	Effect size [Cohen's d, 95% CI]
Only symptomatic patients wear face masks	2.24 ± 1.34	1.88 ± 1.19	t (493) = 3.13, p = 0.0018	d = 0.29 [0.11, 0.47]
Both symptomatic and asymptomatic patients wear face masks	4.15 ± 1.03	4.51 ± 0.89	t (493) = –4.15, p < 0.0001	d = –0.37 [–0.55, –0.19]
Only old people with weak immune systems wear face masks	2.32 ± 1.44	1.88 ± 1.14	t (493) = 4.05, p < 0.0001	d = 0.36 [0.18, 0.54]
Anyone going out of their home should wear a face mask	4.52 ± 0.96	4.79 ± 0.61	t (493) = –4.01, p < 0.0001	d = –0.35 [–0.53, –0.17]
Anyone in social gatherings/crowded places should wear a face mask	4.02 ± 1.33	4.30 ± 1.21	t (493) = –2.62, p = 0.009	d = –0.23 [–0.41, –0.05]
Only surgical masks can protect against COVID-19	2.62 ± 1.21	2.65 ± 1.11	t (493) = –0.29, p = 0.774	d = –0.03 [–0.21, 0.15]
Only N95 masks can protect against COVID-19	2.81 ± 1.26	2.76 ± 1.21	t (493) = 0.44, p = 0.657	d = 0.04 [–0.14, 0.22]
Cloth masks are also effective for preventing spread of COVID-19	2.71 ± 1.32	3.03 ± 1.20	t (493) = –2.62, p = 0.009	d = –0.23 [–0.41, –0.05]
Facemasks are unsafe because they force you to touch your face	2.44 ± 1.25	2.30 ± 1.16	t (493) = 1.27, p = 0.202	d = 0.11 [–0.07, 0.29]
It is hard to form a habit of wearing a face mask while going out	3.08 ± 1.39	2.89 ± 1.31	t (493) = 0.90, p = 0.369	d = 0.08 [–0.10, 0.26]
Wearing a face mask is too much of a hassle	3.00 ± 1.34	2.65 ± 1.15	t (493) = 3.10, p = 0.002	d = 0.28 [0.10, 0.46]
Breathing becomes difficult with face mask	3.41 ± 1.27	3.40 ± 1.20	t (493) = 0.00, p = 0.999	d = 0.00 [–0.18, 0.18]
Only nose should be covered while wearing a face mask	2.23 ± 1.31	2.04 ± 1.13	t (493) = 2.09, p = 0.037	d = 0.19 [0.01, 0.37]
Nose, mouth, and chin should be covered with a face mask	4.26 ± 1.16	4.54 ± 0.83	t (493) = –2.70, p = 0.0075	d = –0.24 [–0.42, –0.06]

People using face masks are cowards	2.13 ± 1.37	1.80 ± 1.14	t (493) = 2.99, p = 0.003	d = 0.27 [0.09, 0.45]
People wearing face masks look untrustworthy	2.33 ± 1.37	1.84 ± 1.14	t (493) = 4.54, p < 0.0001	d = 0.41 [0.23, 0.59]
People wearing face masks look silly	2.06 ± 1.32	1.62 ± 0.96	t (493) = 3.81, p = 0.0002	d = 0.34 [0.16, 0.52]
People wearing face masks look ugly or weird	2.02 ± 1.35	1.62 ± 1.03	t (493) = 3.98, p < 0.0001	d = 0.36 [0.18, 0.54]
Face masks provide a false sense of security	2.39 ± 1.40	1.96 ± 1.17	t (493) = 3.72, p = 0.0002	d = 0.33 [0.15, 0.51]
Using cloth face masks with designs is becoming a fashion	3.98 ± 1.18	4.08 ± 1.05	t (493) = –0.20, p = 0.839	d = –0.02 [–0.20, 0.16]

*p < 0.05; **p < 0.01 = statistically significant.
Independent samples t-tests used for gender comparisons.
Effect size reported as Cohen's d with 95% CI for mean differences.
Responses recorded on a 5-point Likert scale (1 = Strongly disagree → 5 = Strongly agree).
Values are reported as Mean ± Standard Deviation (SD).

Table 4. Behavior towards use of face mask.

Statement	Male (n = 201) Mean ± SD	Female (n = 294) Mean ± SD	p-value	Cohen's d	95% CI
I use surgical mask as it is economical	3.81 ± 1.18	3.71 ± 1.11	0.335	0.09	–0.08 to 0.26
I use N95 mask as it helps me breathe properly and provides better protection	3.25 ± 1.26	3.38 ± 1.20	0.246	–0.10	–0.27 to 0.07
I use cloth mask as it can be made at home with underutilized clothes	2.44 ± 1.31	2.37 ± 1.19	0.536	0.06	–0.11 to 0.23
I do not use face mask due to additional cost in monthly budget	1.90 ± 1.16	1.71 ± 1.04	*0.041	0.17	0.00 to 0.34
I feel like face masks are ineffective against spread of COVID-19	2.31 ± 1.37	2.05 ± 1.19	*0.009	0.20	0.03 to 0.37
I use face mask due to strict laws and rules	2.91 ± 1.46	3.03 ± 1.33	0.424	–0.09	–0.26 to 0.08
I use face mask to increase acceptance in the society	3.02 ± 1.44	2.91 ± 1.32	0.425	0.08	–0.09 to 0.25
I lose confidence having a face mask on	2.04 ± 1.27	1.70 ± 0.95	**0.002	0.30	0.13 to 0.47
I usually keep the dark side in while using a face mask	2.73 ± 1.34	2.44 ± 1.24	**0.006	0.23	0.06 to 0.40
I usually keep the light side in while using a face mask	3.59 ± 1.30	3.51 ± 1.26	0.441	0.06	–0.11 to 0.23
I wear a mask with only my mouth and chin covered to avoid breathing difficulty	2.63 ± 1.43	2.28 ± 1.29	**0.004	0.26	0.09 to 0.43
I wash my face mask after 2 days to re-use it	2.12 ± 1.39	2.25 ± 1.34	0.228	–0.09	–0.26 to 0.08
I discard my face mask in the bin without separating its layers	3.74 ± 1.43	3.80 ± 1.27	0.624	–0.05	–0.22 to 0.12
I do not like feeling forced to wear a face mask	3.33 ± 1.39	3.00 ± 1.28	**0.006	0.25	0.08 to 0.42
I believe I have a very good immune system, so I do not need to wear a mask	2.36 ± 1.37	1.91 ± 1.11	**0.0001	0.36	0.19 to 0.53

*p < 0.05; **p < 0.01 indicate statistically significant differences between male and female participants.
Cohen's d values around 0.2 = small, 0.5 = medium, 0.8 = large.
Most significant differences here are small-to-moderate effects (d ≈ 0.2–0.36).

Discussion

Our study revealed consistent gender-based differences in attitudes and behaviors related to mask use during the COVID-19 pandemic. Men reported greater economic and psychological barriers, such as cost concerns, loss of confidence, and resistance to being compelled to wear a mask. They also expressed more skepticism about mask effectiveness and demonstrated higher frequencies of improper wearing practices, such as covering only the mouth and chin. In contrast, women showed higher adherence to recommended practices, including correct mask positioning, greater acceptance of regulations, and fewer misconceptions that natural immunity alone obviates mask use. These findings align with cross-national evidence showing that women are generally more likely than men to perceive COVID-19 as a serious health threat and to comply with protective measures, including mask wearing [15].

The practical importance of these results is reinforced by global evidence that masks significantly reduce the risk of transmission. Systematic reviews and meta-analyses have consistently confirmed that mask use lowers the risk of respiratory virus infection in both community and healthcare settings, with higher-filtration respirators such as N95s providing stronger protection in high-risk environments [17]. Male skepticism about mask effectiveness is therefore an important public health challenge, since uptake and correct usage are necessary for masks to deliver population-level benefits.

Two methodological issues should be considered when interpreting these findings. First, there are well-documented differences between self-reported and observed practices. Studies using direct observation have frequently found substantially lower compliance than reported in surveys, suggesting that our self-reported data may overestimate actual adherence among both men and women [18]. The gender differences observed here may thus represent true behavioral disparities, but could also be partly influenced by social desirability bias. Future research should triangulate self-reported data with observational or passive monitoring methods to generate more accurate insights. Second, public policies and mandates play a decisive role in shaping behavior. Evidence shows that compliance rises markedly after mask mandates are introduced and that clarity, enforcement, and effective communication strategies strongly influence uptake and normalization of mask use [19,20]. The higher acceptance of regulations observed among women in this study suggests that gender-sensitive policy levers and targeted messaging may help reduce observed disparities.

The implications of these findings are particularly relevant for policymaking. Economic barriers reported by men highlight the need for subsidized or free distribution of effective masks, as well as the promotion of low-cost but protective alternatives with clear user instructions. Such measures are consistent with WHO guidance that stresses equitable access to protective equipment [21, 22]. Addressing skepticism through evidence-based health communication is also vital. Public campaigns should present locally relevant evidence on mask effectiveness while emphasizing correct wearing techniques, and the use of social-norm framing may further enhance uptake among men. Moreover, improper mask usage remains a critical issue, as incorrect practices compromise effectiveness. Interventions should therefore focus not only on attitudes but also on behavior, with practical demonstrations and reminders provided through posters, videos, and pharmacy handouts. Nudges such as signage in high-risk locations and mandate reinforcement could further normalize proper practices. Finally, future research should incorporate more robust measures of mask-related behavior by supplementing self-reports with observational audits, photographic verification, or time-stamped data collection, while also reporting effect sizes and confidence intervals to better inform policymakers.

Our findings extend international evidence on gendered health behavior by documenting small-to-moderate effect sizes across multiple attitudinal and behavioral domains, including mask positioning, confidence, and perceived effectiveness. The consistency of these results with international data suggests that gender differences in preventive health behaviors are not unique to Pakistan. However, the specific magnitudes observed and their local determinants, such as affordability, literacy, and access, highlight the need for interventions that are contextually tailored to Pakistan's population.

Limitations

Limitations should be acknowledged when interpreting these findings. The use of an online survey and non-probability convenience sampling limited participation primarily to educated, urban, and internet-accessible populations, thereby reducing generalizability to Pakistan's broader rural and illiterate communities. Reliance on self-reported data introduced the possibility of recall and social-desirability biases, which may have led to overestimation of adherence. The cross-sectional design further restricted causal interpretation of the associations observed between demographics and mask-related behaviors. Although the instrument demonstrated acceptable internal consistency, more rigorous psychometric validation such as exploratory and confirmatory factor analysis and test–retest reliability would strengthen its robustness. Additionally, contextual factors such as regional enforcement of mandates, detailed socioeconomic status, and availability of masks were not directly assessed, all of which could have influenced behaviors and perceptions.

Conclusion

This study highlights clear gender-based differences in attitudes and behaviors toward mask use during the COVID-19 pandemic in Punjab, Pakistan. Women consistently demonstrated greater adherence to preventive guidelines, correct mask-wearing practices, and acceptance of regulations, whereas men were more likely to report skepticism, discomfort, economic barriers, and improper usage. These disparities underscore the need for gender-sensitive public health interventions that address men's lower compliance through targeted communication, social-norm reinforcement, and equitable access to affordable protective equipment. Furthermore, the underrepresentation of rural and illiterate populations emphasizes the importance of literacy-sensitive and community-based strategies to ensure broader outreach. Taken together, these findings suggest that tailoring interventions by gender, socioeconomic status, and literacy level will be essential to improving compliance, reducing inequities, and strengthening community protection in future pandemics.

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