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Original Article

Assessing Predictors of Self-Care Behavior and Practices to Mitigate Air Pollution: A Cross-Sectional Study Among Undergraduate Students in Rawalpindi, Pakistan

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ABSTRACT

Air pollution constitutes a pressing worldwide public health issue, and Pakistan is the fourth most polluted country, where nearly 99% of its populace breathes in the air quality that exceeds the WHO criteria. Embracing WHO-endorsed strategies can help in extending life expectancy by five years. This investigation was designed to delve into the factors influencing self-care behaviors and practices regarding air pollution based on Health Belief Model among undergraduate students. **Methods:** A questionnaire based on the Health Belief Model was used to conduct a cross sectional study on undergraduate students from Rawalpindi, Pakistan about their self-care and protection practices against air pollution. The questionnaire had seven sections and was validated. Non-probability convenience sampling was used. SPSS 26, Spearman's correlation, and linear regression were used for data analysis. **Results:** The study enrolled 292 university students, with 189 (64.7%) being male and 103 (35.3%) females, and a mean age of 21.07±1.896. Findings revealed that 22.6% of respondents exhibited satisfactory self-care behavior, while 77.4% exhibited suboptimal behavior. In terms of self-care preventive practices, 58.6% scored poorly, with only 41.4% demonstrating good practices. **Conclusions:** The study's outcomes demonstrated poor self-care and protection practices among the participants. Factors such as perceived severity, perceived benefits, self-efficacy, and cues to action significantly influenced preventive behaviors. Whereas, perceived susceptibility and barriers were found insignificant. These findings underscore a notable association between Health Belief Model constructs and students' adoption of preventive measures against air pollution.

INTRODUCTION

Globally, the impact of air pollution has reached alarming proportions, resulting in an estimated 3.1 million premature deaths annually [1]. The World Health Organization (WHO) has instituted stringent air quality standards for various pollutants to gauge the severity of air pollution. Despite these standards, WHO statistics are disconcerting, with nine out of ten individuals worldwide inhaling air characterized by elevated pollution levels. Moreover, over 80% of urban inhabitants residing in regions with air quality monitoring are exposed to pollution levels exceeding WHO recommendations. Notably, an additional three billion people face elevated indoor (household) air pollution due to the utilization of biomass, kerosene fuels, and coal for cooking and heating, leading to a heightened incidence of

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respiratory ailments [2]. In Pakistan, the situation is particularly dire, surpassing many other Asian regions in its severity. A startling revelation is that approximately 11 million premature deaths attributed to air pollution transpired in Pakistan alone, out of a global death toll of 153 million [3]. These alarming statistics position Pakistan as the third most polluted country globally, according to the data provided by the Pakistan Environmental Protection Agency. If air quality in the country continues to deteriorate at this rate, it is anticipated that adherence to WHO standards would extend the average life expectancy by 2.7 years [4]. The ramifications of air pollution extend beyond health concerns and encroach upon academic terrain. There is compelling evidence that links air pollution to cognitive impairment, poor academic performance among students, and increased school absenteeism [5, 6]. This menace further erodes scholastic achievements, reflected in reduced academic scores among school pupils [7-10]. Addressing the multifaceted challenges posed by air pollution necessitates comprehensive health education programs, especially in vulnerable populations [11]. However, developing effective preventative programs hinges on the successful identification of influential factors and predictors [12]. Numerous studies have explored human behavior across diverse ecological contexts [13-15], wherein the application of theories and models by psychologists and social scientists plays a pivotal role in unraveling the intricacies of human behavior [16]. Within this framework, the Health Belief Model (HBM) emerges as a valuable tool for elucidating health behaviors. The HBM delves into cognitive constructs, encompassing beliefs, attitudes, and decision-making processes, all of which profoundly shape health-related actions. Variables such as perceived vulnerability, severity, benefits, barriers, self-efficacy, and cues to action collectively determine the adjustment of health behaviors [17]. The HBM additionally serves as a predictive and intervention-oriented model for devising strategies to enhance health outcomes [18]. Given the exigency of studies in developing countries, this investigation undertakes a comprehensive examination of self-care behaviors and their predictors among university students, specifically in the context of air pollution.

METHODS

A cross-sectional investigation, aimed at evaluating self-care behaviors and personal protective measures in response to air pollution, was carried out over a three-month period, spanning from August to September 2022. The study received the approval of the Institutional Review Board at the National University of Medical Sciences in Rawalpindi on 16 August 2022 under registration 325-AAA-ERC-AFPGMI. Participants in this research were drawn from two academic institutions utilizing a non-probability sampling method. Prior to data collection via self-administered questionnaires, study personnel diligently secured informed consent from each participant. Eligibility criteria encompassed students aged 18 years and above, actively enrolled in undergraduate programs during the data collection phase, possessing proficient English language comprehension skills, and demonstrating a voluntary willingness to participate. Individuals with known cognitive impairments or pre-existing medical conditions that significantly impact self-care behavior were excluded from the study. The sample size for the current study was computed using the online sample calculator Raosoft (http://www.raosoft.com/samplesize.html) by keeping a 95% confidence interval, 5% margin of error and 23.6% distribution response was derived from a similar study by Zafar Fatmi et al., 2020 [19]. The sample size was calculated as 292. A validated questionnaire was adapted and customized to align with the specifics of this research from a previous study [20]. This questionnaire was structured into three distinct sections: the initial segment captured participants' demographic information, followed by a series of inquiries related to self-care behaviors rooted in the Health Belief Model (HBM) framework, and the final section encompassed queries pertaining to personal protective practices. A psychometric response scale, constructed on a 5-point Likert scale, was employed, wherein respondents were prompted to express their degree of agreement with each statement on the scale. The scale designated a score of 0 for "strongly disagree," 1 for "disagree," 2 for "neutral," 3 for "agree," and 4 for "strongly agree." The cumulative score for self-care behavior had a potential range from 0 to 96, with scores equal to or exceeding 60% classified as indicative of adequacy, while lower scores signified inadequacy. In the context of personal protective practices, scores varied between 0 and 16. The data from the self-care questionnaire were quantitatively analyzed using SPSS (Statistical Package for Social Scientists) version 26.0. Descriptive statistics, bivariate Pearson's correlation test, and multiple linear regression were used to analyze the data. The internal consistency was measured using Cronbach's Coefficient Alpha of the various components of the HBM.

RESULTS

This investigation encompassed a sample of 292 undergraduate university students, with 189 (64.7%) being male and 103 (35.3%) females. The sampled students had a mean age of 21.07±1.896. The findings disclosed that a mere 22.6% of respondents exhibited self-care behaviors meeting adequacy criteria, while a substantial 77.4% fell short of the desired standard, yielding a mean score of

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Table 1: Mean and Standard deviation of total grit score

Items		N (%)
Selfcare behavior score	Inadequate <60%	226 (77.4)
	Adequate ≥60%	66 (22.6)
Mean ± SD		49.60±7.94
Selfcare practices score	Poor	171 (58.6)
	Good	121 (41.4)
Mean ± SD		8.54±3.39

N= 292; SBS= Self-care Behavior against air pollution questionnaire score, SPS= Self-care practices score

Table 2 presents the mean and standard deviation values pertaining to the Health Belief Model (HBM) constructs and preventive behaviors associated with air pollution.

Table 2: Means, standard deviations, and internal consistency of health belief model constructs and the air pollution-preventive behaviors

Variables	Mean ± SD	Obtainable Score Range	Internal Consistency*
Perceived susceptibility	2.18 ±0.74	0-12	0.76
Perceived severity	2.58 ±0.59	0-20	0.82
Perceived barriers	2.46 ±0.55	0-16	0.66
Perceived benefits	2.47 ±0.55	0-16	0.87
Self-efficacy	2.27 ±0.67	0-16	0.71
Cues to action	2.41 ±0.51	0-16	0.69
Preventive behavior	2.14 ±0.85	0-16	0.73

Cronbach's alpha (α), n=292. SD=Standard deviation

The results derived from a linear regression model analysis revealed that certain predictive variables, specifically perceived susceptibility ($\beta = 0.121$, $p > 0.05$) and perceived barriers ($\beta = 0.161$, $p > 0.05$), exhibited an absence of predictive influence. In contrast, perceived severity ($\beta = -0.036$, $p < 0.05$), perceived benefits ($\beta = 0.182$, $p < 0.05$), self-efficacy ($\beta = 0.171$, $p < 0.05$), and cues to action ($\beta = 0.121$, $p < 0.05$) demonstrated statistically significant associations with self-care behavior against air pollution within the university student population, as delineated in Table 3.

Table 3: Regression coefficients of HBM construct against self-care behavior

Variables	Regression Coefficients	SE	t-statistics	p-value
Perceived susceptibility	0.121	0.065	0.482	0.630
Perceived severity	-0.036	0.105	2.144	0.033*
Perceived barriers	0.161	0.118	-0.488	0.626
Perceived benefits	0.182	0.073	2.108	0.036*
Self-efficacy	0.171	0.105	3.188	0.002*
Cues to action	0.121	0.065	2.697	0.007*

*Significant at the 0.05 level (one-tailed) n=292

The outcomes of Pearson's correlation analysis unveiled noteworthy associations between all components of the Health Belief Model (HBM) and the preventive behaviors adopted by students in response to air pollution. The specifics, delineated in Table 3, underscore that self-efficacy ($P < 0.001$; $r = -0.0278$), perceived severity ($P < 0.001$; $r = 0.240$), and perceived benefits ($P < 0.001$; $r = 0.182$) exhibited particularly robust correlations with these behaviors, as further detailed in Table 4.

Table 4: Matrix of Spearman's Correlation Coefficient among HBM constructs

Variables	1	2	3	4	5	6	7
Perceived susceptibility	1	-	-	-	-	-	-
Perceived severity	0.240	1	-	-	-	-	-
Perceived barriers	0.171	0.645	1	-	-	-	-
Perceived benefits	0.171	0.645	1.000	1	-	-	-
Self-efficacy	-0.0278	0.243	0.274	0.274	1	-	-
Cues to action	0.178	0.391	0.495	0.495	0.174	1	-
Preventive Behavior	0.166	0.209	0.294	0.294	0.244	0.290	1

DISCUSSION

The primary objectives of this study were to expand the understanding of self-care behavior and personal protective practices among university students in response to the growing challenge of air pollution in Pakistan. With a specific focus on air pollution prevention, the quantitative analysis revealed that the majority of students exhibited inadequate self-care behavior, indicating a lack of awareness and a diminished perception of the severity of air pollution. The findings indicated that a mere 22.6% of participants scored favorably on the self-care behavior questionnaire, while the remaining 77% (n=226) failed to meet the desired standard. Similarly, in the realm of personal protective practices against air pollution, only 41.4% displayed commendable practices, underscoring the overall inadequacy in self-care behavior. It is worth noting that the current study results diverged from a prior investigation among university students in the Northern region of Pakistan. The earlier study reported a higher awareness among subjects regarding various air contaminants and the associated health risks, which translated into a proactive adoption of preventive measures [3]. This discrepancy could be attributed to the differing focus of the behavior under examination, with the current study concentrating on self-care behaviors in the context of air pollution, while the former research centered on self-care practices related to diabetes [21]. The present study's fundamental aim was to identify the determinants of protective behaviors against air pollution among

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undergraduate students, leveraging the Health Belief Model (HBM). The HBM constructs collectively explained 13.95% of the variance in students' preventive behaviors. In line with previous research on similar subjects, study findings confirmed that perceived benefits, self-efficacy, perceived severity, and cues to action emerged as more robust predictors of self-care behavior. Conversely, perceived susceptibility and barriers proved to be less influential predictors of self-care behavior, potentially due to the high scores of these constructs within the study population. This might be indicative of the influence of public health programs delivered through various media outlets, including television and radio, which may have contributed to heightened awareness without necessarily translating into corresponding health-promoting behaviors [22]. The Health Belief Model (HBM) has demonstrated its utility in predicting preventive actions against infectious diseases in earlier research, such as SARS, Middle East respiratory syndrome (MERS), H1N1 influenza, and other respiratory infections [23]. The model's predictive power has been evidenced in various contexts, where perceived vulnerability, perceived advantages, and cues to action have played pivotal roles in influencing preventive behaviors. Notwithstanding the valuable insights this study has provided into students' comprehension of the pressing issue of air pollution and their corresponding behaviors and practices for preventing health hazards, it is important to acknowledge the limitations. The study relied on self-reported data, which may not perfectly reflect actual behaviors. Future research could benefit from assessing students' real-world actions rather than solely relying on self-reported behavior. Additionally, the study's sample was drawn from only two academic institutions due to resource and time constraints, thereby limiting the generalizability of the findings to a broader student population. Nonetheless, this study makes a meaningful contribution to the limited body of research focused on this pressing issue. It serves as a bridge between public awareness and the latest research findings, shedding light on the implications for Pakistan. The study's results hold significance for policymakers, environmentalists, and educational institutions, offering insights into their roles in addressing and mitigating the detrimental effects of air pollution on human health and the environment.

CONCLUSIONS

The results of the study reveal that a substantial majority of students exhibit subpar self-care behaviors and preventive practices in response to air pollution. Notably, among the constructs of the Health Belief Model (HBM), perceived severity, perceived benefits, and self-efficacy emerged as noteworthy predictors of self-care behavior concerning air pollution. The robust correlations observed among these constructs hold promise for the potential development of theory-based preventive programs aimed at enhancing future outcomes. In the context of Pakistan's air quality and the well-being of university students, the current study's findings represent a significant stride towards addressing these issues and steering them in a positive direction.

Authors Contribution

Conceptualization: SB, A
Methodology: SB, LN, RL, FZ
Formal analysis: SB, FP, HM, AK
Writing, review and editing: SB, A, FP, HM, SG
All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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