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Research Paper

Perception towards waste management among college students of Kashmir Valley: an empirical study

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ABSTRACT

Waste management has become a critical environmental issue in developing regions due to rapid urbanization, population growth, and changing consumption patterns. Educational institutions play a significant role in shaping environmentally responsible behaviour among young people. This study examines the awareness and attitudes of college students in Kashmir Valley regarding waste management practices. A quantitative survey method was adopted using a structured questionnaire administered to 400 college students selected through multistage random sampling from various colleges in Kashmir. Descriptive statistical tools such as percentages, frequency distribution and Chi square tests were used to analyse the data. The findings reveal that most students demonstrate moderate to high awareness regarding waste segregation, recycling and environmental protection, yet gaps remain in practical implementation and participation in waste management initiatives. The study, based on survey results and published sources, highlights the need for stronger environmental education programmes, campus based waste management initiatives, and awareness campaigns to promote sustainable practices among students. The results suggest that students can act as catalysts for community level environmental awareness if properly guided and supported.

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1. INTRODUCTION

There is an increase in waste production due to urbanization, industrialization, and increasing consumerism worldwide. Poor waste management leads to environmental pollution, health hazards, and environmental degradation since municipal solid waste comprises biodegradable waste, recyclable waste, and hazardous waste and thus needs proper segregation, treatment, and disposal.

Poor waste management has been a major problem in developing countries like India, as there is low awareness, poor infrastructure, and poor enforcement of environmental policies. The educational institutions play a significant role in creating environmental awareness and proper waste management behavior among the students who form an important section of society who can bring about sustainability.

Solid waste management involves waste reduction, segregation, recycling, reusing, composting and proper disposal, and effective solid waste management needs the cooperation of citizens along with proper environmental attitudes. The studies reveal that awareness and attitudes greatly impact the waste disposal behavior and recycling of individuals.

The students are aware of various environmental problems due to environmental educational programs and sustainability campaigns all over the world, but that doesn't mean that they have good practices about the same issue. Many students know the significance of segregating waste but cannot do it due to absence of facilities and/or motivation.

Management of waste has become an important issue in the Kashmir Valley, especially Srinagar, due to the growth of its population and tourism activities. The improper disposal of waste has led to contamination of water bodies such as Dal Lake and its ecosystems that are very important in terms of ecological system and tourism. Hence, understanding the awareness and attitude of college students regarding waste management has become necessary for sustainable environment.

The main objective of this study is to analyze the awareness and attitude of college students of District Srinagar regarding waste management.

2. RELATED WORK

There have been some scholars who have carried out research on awareness, attitudes, and practices on waste management among the youth and the communities. Some research has been conducted on awareness, attitudes, and practices on waste management among the youth and the community. One such study which focused on students' awareness and attitudes on municipal solid waste management discovered that although there was some awareness among the students, few were practicing waste reduction and segregation [1]. The significance of behaviour change and environmental education in the adoption of sustainable waste practices was stressed. Another research, which was based on Theory of Planned Behaviour, showed that attitude, subjective norms, and perception of behavioural control had considerable effects on students' intentions to practice waste management [2], [3].

It is important to note that environmental education has been found to be one of the main components responsible for enhancing knowledge and awareness about waste management among students [4]. Several studies have been conducted on e-waste management practices, where it was established that despite the knowledge that students have about the dangers of improper disposal of electronic waste, they have no proper means of disposing of such wastes [5], [6]. Education has been seen as an important aspect that will enhance the development of awareness on sustainable waste management [7]. Lack of awareness and inadequate infrastructure were some of the major barriers observed in rural settings when it comes to waste disposal [8].

In addition, research has shown that involvement in environmental programs raises the level of awareness and develops positive attitudes towards waste management [9]. It has been seen that awareness campaigns and environmental education programs play an important role in improving the practice of waste segregation among youth [10]. Institutional support and proper infrastructure facilities have also been recognized as important factors in making the youth environmentally conscious [11].

In addition, waste management issues in urban settings have been cited as a result of behaviour rather than ignorance [12]. Awareness regarding the environment has been found to contribute towards enhancing participation of students in waste minimization activities [13]. It has been recommended that colleges and universities adopt sustainability projects initiated by the students to in still proper waste management habits [14]. In addition, youth involvement is an important aspect for attaining sustainability goals of environmental management [15].

An 80-study systematic literature review showed that most studies concerning waste management behavior are concerned with recycling and individual behavioral theories, mainly the Theory of Planned Behavior. The authors stressed the need for interdisciplinary and greater attention to social aspects in waste management [16]. Moreover, a systematic review of 699 articles revealed that waste management behavior of consumers depends on psychological, economic, social and institutional factors. The authors stressed the necessity of an interdisciplinary approach and appropriate policy frameworks to promote sustainable behavior [17]. Another review pointed out that the COVID-19 pandemic changed municipal solid waste production greatly – there is a rise in household, medical and plastic waste production. The review stressed the necessity of waste handling, proper treatment methods and circular economy approaches such as resource recovery and waste-to-energy to manage the waste sustainably [18]. In a systematic review of 84 articles, authors described the variety of waste produced by MSMEs. Though such practices as recycling and composting are widespread, the implementation of these practices is often limited due to financial, technical and training challenges [19]. Another study noted that awareness and participation of the public are crucial to proper waste management. The authors underlined the necessity of environmental education at schools and teachers' training [20].

Generally, based on the previous studies, it can be observed that despite having adequate awareness about waste management, the participation in such activities has been poor due to a lack of proper infrastructure, motivation, and institutional support. The main objectives of the our study were

(i) To assess awareness as well as attitude of students' towards waste management
(ii) To identify students' practices related to waste management.
(iii) To suggest measures for improving waste management awareness among students

3. METHODOLOGY

In the present survey conducted during 2025-26, a well-designed pre tested questionnaire was employed to collect the information from the sample of 400 (200 male & 200 female) College students selected randomly via online/offline mode from different Colleges of Kashmir using multistage random sampling procedure. The respondents under study were explained, the main purpose of this study to get their consent. The questionnaire was designed to access the awareness among College students of Kashmir. The 3-point likert scale was used to assess the level of awareness among respondents understudy. The sample size for current study was computed using

$$\mathrm{n} = \frac{Z\alpha/22P(1-P)}{d^2}$$

Here, we chose p=0.5, $Z_{\alpha} = 1.96$ and d=0.05. That gives for our study the sample size n~384 and we decided to take n = 400. The data collected was tabulated, analyzed and interpreted statistically. The statistical software SPSS (version 20) was used for analysis of collected data.

3.1 Research Hypothesis

Hypothesis: There is no significant difference in the level of awareness between male and female collegestudents under study.

In order to test this research hypothesis, we use Chi-square test (with usual notations) given below:

$$X^2 = \sum_{i=0}^{n} \frac{(O_{\mathrm{i}} - e_{\mathrm{i}})^2}{e_i}$$

Where $X^2 \sim \chi_1^2$, o_i and e_i are observed and expected frequencies. We reject H_0 if p-value is less than specified level of significance.

Mann-Whitney U test can also be used for comparison purpose, when we use likert scale. It is given (with usual notations) as

$$W = N_1N_2 + \frac{N_x(N_X + 1)}{2} - T_x$$

Where, N_1 represents the number of subjects in group 1; N_2 represents the number of subjects in group 2. Txis the larger of the two rank totals and N_x is the number of subjects in this group.

3.2 Data Analysis

Graphical representation was used to summarize the results obtained from survey. To assess the awareness and attitude among respondents' descriptive statistics was used. Further, for comparison purpose Chi-square test was used using statistical software SPSS (version 20).

3.3 Data Interpretation

The results obtained were interpreted in the context of the research objective, and conclusions were drawn regarding the awareness and attitude of students towards waste management in Kashmir valley.

4. RESULTS AND DISCUSSION

The data collected from 400 College going students (200male and 200 female) studying in various higher educational institutes of Kashmir valley is presented below Table 1. The researcher had considered young generation to know the level of awareness towards waste management among educated youth in Kashmir. The primary data of the study was collected with the help of a survey using structured questionnaire andrandom sampling technique. The data collected was analyzed and evaluated using standard statistical procedure to get the results. The data presented in Table 1, shows the demographic characteristics of the respondents understudy. It was found that from 400 respondents (50% male and 50% female) majority of the respondents were urban areas (56.75%), science stream (60.5%) and in the age group of 22-24 years (64.75%). The respondents understudy were explained in brief the purpose of study and on their consent were included in this study.

Table 1. General Information of the Respondents under Study

S. No.	Variable	Type	Frequency	Percentage (%)
1.	Gender	Male	200	50.00
		Female	200	50.00
2.	Residence	Rural	173	43.25
		Urban	227	56.75
3.	Stream	Science	242	60.5
		Arts	158	39.5
4.	Age (years)	22-24	259	64.75
		>24	141	35.25

The data presented in Figure 1, revealed that majority of respondents (male=71.5%, female=81.5%) told their source of information was T.V./Radio, followed by Teachers/Colleges (male=63.5%, female=69.5%), followed by Social media (male=57.5%, female=49.5%), followed by Newspaper (male=12.5%, female=9.5%) and followed by others (male=7.5%, female=6.0 %).

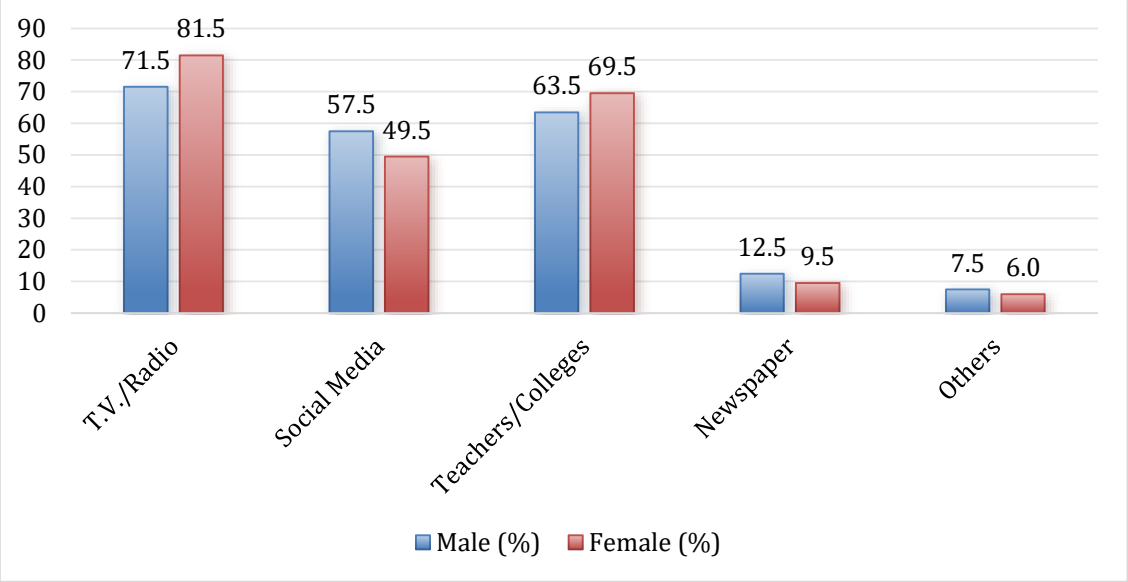


Figure 1. Source of Information among the Respondents under Study

The data presented in Table 2, revealed that in response to statement 1, i.e., Have you heard about waste management, majority of respondents (male= 93.0%, female=92.0%) responded yes. In response to statement 2, i.e., Do you know the concept of Reduce, Reuse, and Recycle (3Rs), majority of respondents (male=85.5%, female=72.5%) responded yes, in response to statement 3, i.e., Are you aware of waste segregation (separating biodegradable and non-degradable waste), majority of respondents (male=78.5%, female=75.5%) responded yes, in response to statement 4, i.e., Do you know that improper waste disposal can cause environmental pollution, all the respondents (male= 100%, female=100%) responded yes, in response to statement 5, i.e., Which type of waste is biodegradable, majority of respondents (male=93.5%, female= 95.5%) responded food waste, in response to statement 6, i.e., What is your main source of information about waste management, majority of respondents (male=51.5%, female=55.5%) responded T.V./Radio, followed by social media (male=34.5%, female=24%). Further, Table 2, revealed that in response to statements 1, 3 and 5, statistically there was a non-significant difference in the opinion between male and female respondents (P>0.05). In response to statements 2 and statement 6, statistically there was a significant difference in male and female respondents (P<0.01).

Table 2. Awareness among College going Students of District Srinagar on Waste Management (Male=200, Female=200)

S. No.	Statement	Response	Gender		Chi square	P-Value
			Male	Female		
1.	Have you heard about waste management?	Yes	186	184	0.144	>0.05
		No	14	16		
2.	Do you know the concept of Reduce, Reuse, and Recycle (3Rs)?	Yes	161	145	8.634	<0.01
		No	29	55		
3.	Are you aware of waste segregation (separating biodegradable and non-degradable waste)?	Yes	157	151	0.508	>0.05
		No	43	49		
4.	Do you know that improper waste disposal can cause environmental pollution?	Yes	200	200	NA	NA
		No	0	0		
5.	Which type of waste is biodegradable?	Food waste	187	181	1.223	>0.05
		Plastic	13	19		
		Glass	0	0		

		Metal	0	0		
6.	What is your main source of information about waste management?	T.V./Radio	103	111	6.518	<0.05
		Social Media	69	48		
		Teachers/College	28	41		

The data presented in Table 3, revealed that in response to statement 1, i.e., Waste management is essential for protecting the environment, majority of respondents (male=94%, female=92%) agree, in response to statement 2, i.e., Students should actively participate in waste management programs, majority of respondents (male=95.5%, female=91.0%) agree, in response to statement 3, i.e., Waste segregation should be practiced in every household majority of respondents (male= 84.5%, female=86.5%) agree, in response to statement 4, i.e., Colleges should organise awareness programs about waste management, all respondents understudy (male=100%, female=100%) agree, in response to statement 5, i.e., Plastic use should be reduced to protect the environment, all respondents understudy (male=100%, female=100%) agree, in response to statement 6, i.e., I am willing to participate in waste management activities in my college, majority of respondents (male= %, female= %) agree , in response to statement 7, i.e., Government and local authorities should take strict action against improper waste disposal, majority of respondents (male= 94%, female= 90.5%) agree. It has been observed that in response to all statements, statistically there was non-significant difference in male and female respondents in their opinion (P>0.05).

Table 3. Attitude among College going Students of District Srinagar on Waste Management (Male=200, Female=200)

S. No.	Statement	Response	Gender		Chi Square	P-Value
			Male (%)	Female (%)		
1.	Waste management is essential for protecting the environment?	Agree	188 (94)	184(92)	0.614	>0.05
		Neutral	12 (6)	16 (8)		
		Disagree	0 (0)	0 (0)		
2.	Students should actively participate in waste management programs?	Agree	191 (95.5)	182 (91)	3.217	>0.05
		Neutral	9 (4.5)	18 (9)		
		Disagree	0 (0)	0 (0)		
3.	Waste segregation should be practiced in every household?	Agree	169 (84.5)	173 (86.5)	0.323	>0.05
		Neutral	31 (15.5)	27 (13.5)		
		Disagree	0 (0)	0 (0)		
4.	Colleges should organise awareness programs about waste management?	Agree	200 (100)	200 (100)	NA	NA
		Neutral	0 (0)	0 (0)		
		Disagree	0 (0)	0 (0)		
5.	Plastic use should be reduced to protect the environment	Agree	200 (100)	200 (100)	NA	NA
		Neutral	0 (0)	0 (0)		
		Disagree	0 (0)	0 (0)		
6.	I am willing to participate in waste management activities in my college	Agree	167 (83.5)	154 (72)	4.218	>0.05
		Neutral	26 (13)	41 (20.5)		
		Disagree	7 (3.5)	5 (2.5)		
7.	Government and	Agree	189 (94.5)	181 (90.5)	2.306	>0.05

	local authorities should take strict action against improper waste disposal	Neutral	11 (5.5)	19 (9.5)		
		Disagree	0 (0)	0 (0)		

The data presented in Table 4, revealed that in response to statement 1, i.e., Do you separate waste at home or in your hostel, majority of respondents (male=62%, female=65%) reported sometimes, in response to statement 2, i.e., Do you avoid using single-use plastic items, majority of respondents (male=71%, female=61.5%) reported always and in response to statement 3, i.e., Have you ever participated in any cleanliness or waste management campaign, majority of respondents (male= 77 %, female= 73%) reported no. It was found that statistically there was a non-significant difference in statement 1 and 3 (P>0.05) whereas there was a significant difference male and female respondents in statement 2 (P<0.05).

Table 4. Practice among College going Students of Kashmir in Waste Management (Male=200, Female=200)

S. No.	Statement	Response	Gender		Chi Square	Chi Square
			Male	Female		
1.	Do you separate waste at home or in your hostel?	Always	19 (9.5)	22 (11)	1.327	>0.05
		Sometimes	124 (62)	130 (65)		
		Never	57 (28.5)	48 (24)		
2.	Do you avoid using single-use plastic items?	Always	142 (71)	123 (61.5)	6.365	<0.05
		Sometimes	38 (19)	46 (23)		
		Never	18 (9)	31 (15.5)		
3.	Have you ever participated in any cleanliness or waste management campaign?	Yes	46 (23)	54 (27)	3.645	>0.05
		No	154 (77)	146 (73)		



Figure 2. Waste on Road Side(s) Causing Many Environmental and Health Problems

The government and local bodies have introduced door-to-door waste collection services through the Solid Waste Management Committee (SMC) in most areas of Kashmir. During survey as shown in Figure 2 below, we observe dustbins on road side in areas covered by door-to-door waste collection which need to be removed. These roadside dustbins often overflow, create foul smells, attract stray animals, and become breeding grounds for flies, mosquitoes, and other disease-causing organisms. They also affect the beauty and cleanliness of the city. Since waste is already being collected directly from households, there is a need to gradually remove such dustbins from residential and commercial areas where door-to-door collection is functioning effectively. There is need for authorities to improve garbage collection methods, promote separation of garbage, and ensure timely collection of the garbage. This will help improve public

health, maintain environmental hygiene, and contribute to a cleaner and healthier Kashmir. A clean environment is the responsibility of both the government and citizens, and eliminating unnecessary roadside dumping points can be an important step towards achieving this goal.

The Figure 3, below clearly shows the negligence of hospital management and people who on the occasion of Eid UlAdha sell animals for Qurbani and leave dead animals in open which creates problems for whole area. Sellers, Govt. and other agencies must take at most care of disposal of dead animals as they can create health issues in area. Further, Islam guides us to properly dispose the waste parts of animals after sacrifice.



Figure 3. Improper Disposal of Hospital Waste, Dead Animal and QURBANI Parts

It has been observed during survey that a number of houses were constructed on the banks of water bodies and bathroom pipes openly kept towards water bodies as shown in Figure 4. In Dal lake and around Jehlum the bathroom waste/outlet of sewage pipes joins these water bodies. The water is used for irrigation without any treatment or drinking purpose without proper treatment generally. The untreated waste water from bathrooms, Vehicle washes, hospital wastes, industrial wastes and households often finds its way into rivers, lakes, streams, and other water bodies of Kashmir. This contamination degrades water quality and can contribute to the spread of water-borne diseases among people who use or consume polluted water. Running water, regardless of religion, is not only a resource but also a blessing that helps sustain life. In the Islamic religion, for instance, water is a blessing from Allah, and great importance is placed on its conservation. The Quran states that Allah created all living things from water: “And we made from water every living thing.” (Quran 21:30). Protecting water bodies is not merely an environmental responsibility; it is a moral and religious obligation, because water is the source of life and a trust that must be preserved for future generations.



Figure 4. Improper House Hold Waste Management and Drainage Issues

The data shown in Figure 5, reveals that during survey/discussion with respondents, it was observed that 95.5% respondents told that the main factors responsible for waste management are (i) Role of Govt. agencies in environment protection (94.5%), Role of Priests, NGO's and Elders in waste management (91.0%), Organization of Awareness Programs on regular basis for proper waste management (87.5%), availability of CCTV on all important places/Institutions (82.5%) and Participation of students and community members in programs to ensure proper waste management (73.5%). Waste Management in scientific way is the collective responsibility of every individual living anywhere on earth as it isdirectly linked with human health, environmental protection, and sustainable development.

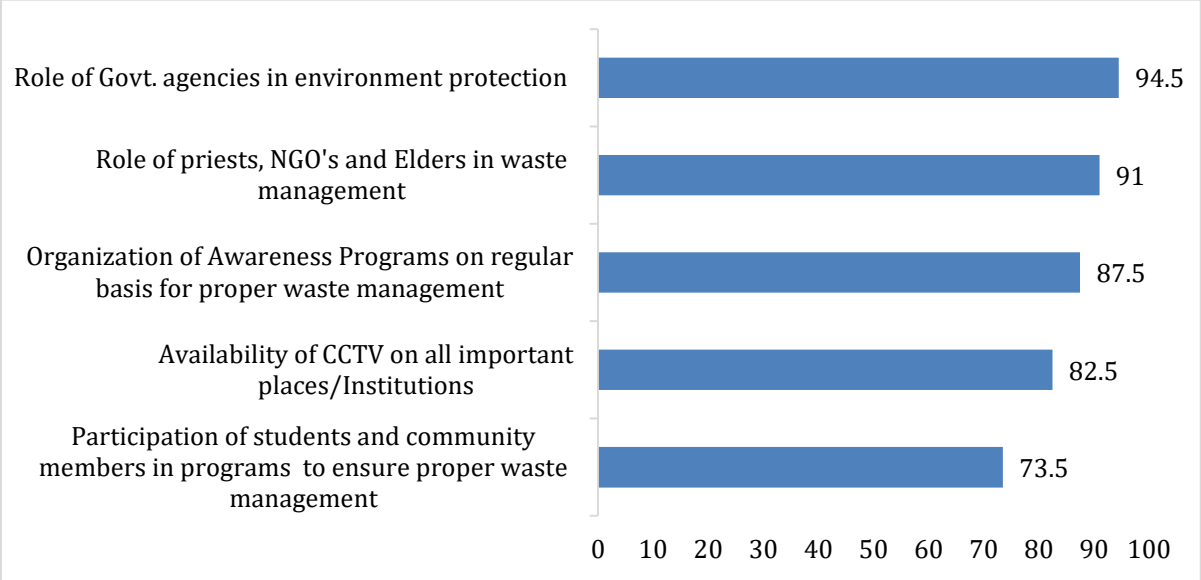


Figure 5. Main Suggestions for Waste Management Percentage (%)

Figure 6 illustrates the various awareness programmes conducted to promote environmental sustainability, including waste management awareness campaigns and interactive sessions with students. These programmes were designed to enhance participants' understanding of waste segregation, proper waste disposal practices, recycling, and environmental conservation through active engagement and discussions.



Figure 6. Awareness Program/ Survey on Waste Management

5. CONCLUSION

Proper waste management is the collective responsibility of each individual, since it is closely connected with human health, the preservation of the environment and sustainable development. Nowadays, careless disposal of the waste poses great danger for human beings, as it leads to pollution, spreading of diseases, contamination of water resources and harming of ecosystems. Therefore, everyone should be aware of his duties regarding proper waste management, so that the present and future generations may have an opportunity to live healthy.

The first one is to reduce the production of the waste by leading a responsible lifestyle. People should refrain from using plastic products in abundance, wasting food and preferring reusable and eco-friendly materials.

The research shows that the college students of Kashmir valley demonstrate rather moderate or high level of knowledge concerning waste management. The majority of them understand the necessity of segregation of waste, its recycling and environmental protection, but still some gap exists between knowledge and practical actions. Despite the fact that many of them have positive attitude to waste management, they do not show active participation in these initiatives. This means that more practical education about the environment and the process of waste management is required. In addition, discharge of untreated wastewater from bathrooms and households in Kashmir is an increasing problem, which may negatively affect both aquatic ecosystem and people who use these waters. The strengthening of the sewage systems, scientific approach to waste disposal and public awareness is crucial in this case. The educational institutions should hold workshops, campaigns, waste segregation programs regularly. The students can become environmental ambassadors and encourage other people in their environment to adopt proper waste management habits. The environmental degradation, which is caused by improper waste management, leads to global warming, extinction of species and worsening of health conditions. Waste management is closely connected with the human life because only clean environment gives an opportunity to have good health, clean water and air.

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Author Contributions Statement

Name of Author	C	M	So	Va	Fo	I	R	D	O	E	Vi	Su	P	Fu
Dr. Bilal Ahmad Bhat	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓			
Dr. Sidrat-Ul-Muntaha Anees		✓			✓	✓	✓	✓		✓	✓			
Mehru Nisa		✓			✓	✓	✓	✓		✓				
Mariya Mushtaq		✓			✓	✓		✓	✓	✓	✓			
Intizar Ahmad	✓	✓		✓					✓			✓	✓	

C : **C**onceptualization
M : **M**ethodology
So : **So**ftware
Va : **Va**lidation
Fo : **Fo**rmal analysis
I : **I**nvestigation
R : **R**esources
D : **D**ata Curation
O : Writing - **O**riginal Draft
E : Writing - Review & **E**diting
Vi : **Vi**sualization
Su : **Su**pervision
P : **P**roject administration
Fu : **Fu**nding acquisition

Conflict of Interest Statement

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.

Ethical approval

There was no ethical approval needed for this study.

Data availability

The data supporting the findings of this study are available from the corresponding author upon reasonable request.

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