

# Factors Affecting Willingness to Pay for Improved Solid Waste Management in Quetta, Pakistan

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ARTICLE INFO	ABSTRACT
<p><b>Article type:</b> Research Article</p> <p><b>Received:</b> 2024/10/27</p> <p><b>Accepted:</b> 2025/03/22</p> <p><b>pp:</b> 47- 58</p> <p><b>Keywords:</b> Willingness to pay; Improved solid waste management; Solid Waste Management; Waste Management Practices; Quetta; Balochistan; Pakistan.</p>	<p><b>Background:</b> Solid waste management is continuing to be a major challenge across the globe, especially in the developing world, with Pakistan not exempt.</p> <p><b>Objectives:</b> The aim of this study was to explore the factors affecting willingness to pay for improved solid waste management in Quetta Metropolitan City, Balochistan, Pakistan.</p> <p><b>Methods:</b> We employed multistage sampling for this cross-sectional study to select the households. The data was collected between November 2022 and December 2022 from 400 respondents through a questionnaire-based survey. We analyzed the data using both descriptive and inferential statistics.</p> <p><b>Results:</b> The findings revealed that 76.5% of the respondents were willing to pay for improved solid waste management (ISWM) in Quetta. The logistic regression analysis on households' willingness to pay for ISWM waste revealed that age, gender, educational attainment, type of family, monthly income, and education on waste disposal were positively associated with willingness to pay. The findings imply that people with higher incomes are more willing to pay for better waste management. Economic disparities among the respondents affect community involvement in waste management. Urgent action is needed to address environmental and health problems caused by poor waste disposal in Quetta.</p> <p><b>Conclusion:</b> As most Quetta residents are willing to pay for improved solid waste services, the study presents a key opportunity for municipal authorities to implement sustainable, community-supported reforms that could help alleviate budget constraints. These may include establishing a user fee system, a municipal waste fund, and a digital payment platform. The public-private partnerships (PPPs) and integration of informal collectors into formal systems can further enhance efficiency. Finally, mass awareness campaigns at the community level and in educational institutions can significantly improve waste management practices.</p>



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## 1. INTRODUCTION

The procedure of producing, gathering, shipping, isolating and disposing of solid waste falls under solid waste management. Solid waste encompasses all items

deemed undesirable and futile by society (Asim & Salam, 2016). Only when we discard an apparatus without any expectation of reuse, despite its intrinsic value, does it become waste (Khattak et al., 2009). This

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definition has been recognised in the term 'practices differ for developed and developing countries because of the effect of several factors such as economy, politics and culture (Miao, 2018). A material becomes waste when it is discarded without expecting to be compensated for its inherent value (Khattak et al., 2009).

Globally, the quantity of municipal waste is increasing more rapidly than the rate of urbanisation; in 2012 the cities of the world created around 1.3 billion tonnes of solid waste, amounting to 1.2 kg per day per person. Due to growth of population and urbanisation, municipal management of waste production is anticipated to be 2.2 billion tonnes by 2025 (Aoike, 2019; Shahzada et al., 2024). Currently, in sub-Saharan Africa, the annual production of municipal solid waste is approximately 62 million tonnes, which averages to 0.65 kg per person per day (Wilson et al., 2012). Globally, solid waste management remains a significant challenge, particularly in rising cities and urban areas of the developing world. Each year, about 1.3 billion tonnes of solid waste are generated by the world's urban areas, and this volume can be increased to 2.2 billion tonnes by 2025 (Afroz et al., 2009).

Municipal solid waste (MSW) could be explained as consisting of all non-hazardous wastes and domestic refuse, like institutional and commercial wastes, street sweepings, and construction garbage (Magutu & Onsongo, 2011). Municipal waste includes garbage collected by or on behalf of municipal management authorities or directly by the private sector, not municipalities, such as private non-profit institutions or businesses; it is actually generated by households, offices, and public institutions (Miao, 2018). In addition to waste generated by households, municipal solid waste also includes refuse from hotels, offices, shopping complexes, schools, shops, and institutions, as well as waste produced by municipal services such as the maintenance of recreational areas and street cleaning (Magutu & Onsongo, 2011).

According to McGranahan (1993), waste management in most developing countries seems to be a serious environmental problem in individual homes and around them (Rahji et al., 2009). The issue of solid waste in Dhaka, the capital of Bangladesh, is much more serious than that in other cities of developing countries (Afroz et al., 2009). In Nepal, solid waste management is a major problem for the national and provincial governments. The total budget that is spent

on municipal waste management is around 10%, and about 63.2% of waste is collected by municipalities (Maskey & Singh, 2017). Rathai (2007) estimated that Mumbai produces approximately 6,256 tonnes of waste daily. In Mumbai, the Municipal Corporation of Greater Mumbai (MCGM) is responsible for waste management services (Khattak et al., 2013). According to Lijun Zhao (2009), in China, households generate 60% of MSW on a daily basis, which mostly consists of paper, organic matter, plastic, textiles, metals, and others (Miao, 2018).

In Nigeria, 21% to 81% of the collection rate of solid waste is mostly prohibited in high discernibility regions where people are willing to pay about the proper collection of solid waste (Akhtar et al., 2017). According to a study in Eskişehir Metropolitan, the municipality generally recognised that citizens' expectations were lower than municipal services. Satisfaction with waste assortment also impacts the WTP for solid waste management. Households who are more satisfied with collection will pay more than dissatisfied ones (Akgul & Sciences, 2012).

Annually Pakistan produces 48 million tonnes of solid waste. Overall, Pakistan has poor infrastructure for solid waste, which results in serious health and environmental issues (Mukherji, 2018a). In large population centres, like Karachi, solid waste management, horticulture, and parks are the most prominent issues (Asim & Salam, 2016). This poses negative effects on the environment and health of millions of citizens of Karachi. The Government of Pakistan estimates 77000 tonnes of solid waste are produced in the country each day; all of this material is produced in the metropolitan cities, including Karachi, which produces an average of 13000 tonnes of municipal solid waste each day (Mukherji, 2018a).

Solid waste management in Balochistan has been one of the challenges in urban services delivery (Ain et al., 2023; Muhammad et al., 2024). Research studies in Balochistan have reported that the rate of urbanisation and urban sprawl has accelerated in recent years, particularly in Quetta (Bazai & Panezai, 2020), highlighting the need to improve waste management services (Malik et al., 2022). Rehman et al. (2021) have described food loss and waste in the Quetta metropolitan area as compact awareness issues at the household level. There is an acute shortage of literature that has assessed the willingness to pay for improving solid waste management in Quetta city. Therefore, this study aimed

to analyse the factors influencing willingness to pay for improved solid waste management in Quetta Metropolitan City, Balochistan, Pakistan.

## 2. METHODOLOGY

### 2.1. Study Design

The case study research design was used for this study that involves the in-depth investigation of a specific case, individual, group, even or a topic under study.

### 2.2. Setting

Quetta is the largest and most populous city of the province Balochistan (Bazai & Panezai, 2020). The city is located at 30.17° North latitude and 66.97° East longitude, respectively (Khan et al., 2020). Quetta is the provincial capital of Balochistan, a province that lags behind in socio-economic indicators (Panezai, 2017; Panezai, 2012). The population of Quetta city constitutes 2,595,492 as per the census of 2023 (Pakistan Bureau of Statistics, 2023). Pashtoon, Baloch, Bravi, Sidhi, Punjabi, Hazara, and other minor ethnic groups inhabit the city (Ali & Panezai, 2021). Only Quetta city has been granted the status of a Metropolitan Corporation in the province. The management of solid waste has been one of the challenging issues of the city.

### 2.3. Conceptual Framework

The aim of the study is to evaluate willingness of households to pay about improved solid waste

management (ISWM) services in Quetta city, Balochistan. For this purpose, the respondents were asked about their willingness to pay about better management of solid waste. We also asked them about the current waste management practices in their areas. We used binary logistic regression to explore the relationship between the independent variables (IVs) and the dependent variable (DV). The dependent variable is willingness to pay and will be measured by yes for willing and no for not willing (Balasubramanian, 2019; Mulat et al., 2019). The independent variables include age, gender, caste, marital status, ethnicity, family type, family size, monthly income, household ownership, satisfactions on current situation, amount willing to pay, environmental awareness (Balasubramanian, 2019; Ndau & Tilley, 2018; Song et al., 2016b; Tassie & Endalew, 2020; Wegedie et al., 2020). The willingness of respondents for improved solid waste management would help urban planning and management authorities, particularly the Metropolitan Corporation Quetta (MCQ) in better solid waste management in Quetta city. The findings of this study are also helpful to assess the progress of provincial and districts governments in achieving Sustainable Development Goals (SDGs), particularly the Goal-11 which is aimed to make the human settlements & cities safe, resilient, sustainable and inclusive across the globe.

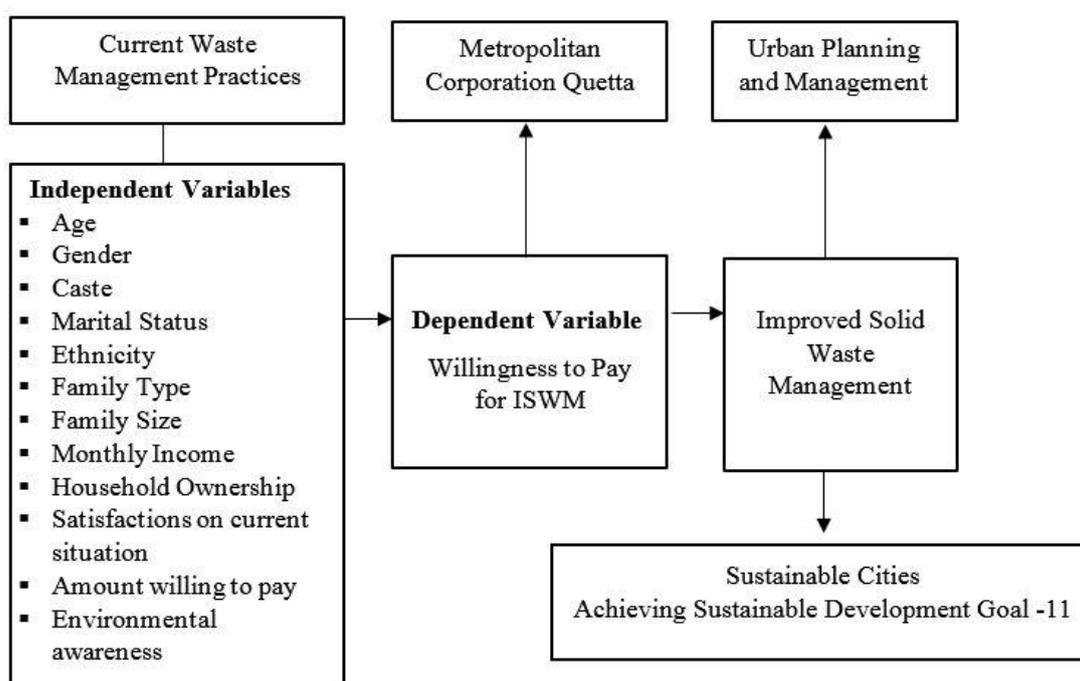


Fig 1. Conceptual Framework

## 2.4. Study Variables

The study involved both dependent variable (DV) and independent variables (IVs). The DV was willingness to pay whereas the IVs included the socio-demographics characteristics of the respondents.

## 2.5. Data Sources and Data collection

The primary data, which were collected between November 2022 to December 2022 in Quetta city Balochistan. Tool for the data collection was Questionnaire, on improved solid waste management. A proper survey was managed for 400 questionnaires, in which 210 were collected from three different Universities like, the University of Balochistan (UoB), Quetta, the Sardar Bahadur Khan (SBK) Women University, Quetta and The Balochistan University of Information Technology, Engineering, and Management Sciences (BUIITEMS) and the remaining 190 were collected from the business sector such as Thoghi Road, Sariab Road, Main AirPort Road, Circular Road, Main Nawan Killi Road, Fatima Jinnah Road and Sabzal Road.

## 2.6. Unit of Analysis

The shopkeepers and households in Quetta city are the units of analysis for this study.

## 2.7. Sample Design

This study employed multistage sampling for the selection of sample and data collection. The purposive and simple random sampling techniques were used for the current research. The purposive sample, also known as subjective sampling, is type of non-probability sampling in which the sample is selected subjectively keeping in view the requirements of the study. Moreover, simple random sampling was used for selection of the respondents. Details of the sampling stages are given below.

### ▪ Stage 1

In the first stage, Quetta City is selected purposively as a study area for current research. The reason for selection of Quetta is that it is the provincial capital of

Balochistan province. It is the most urbanized city of Balochistan. Due to mass urbanization and poor urban planning, the solid waste management has been a challenging issue for the Metropolitan Corporation Quetta (MCQ).

### ▪ Stage 2

In the second stage, we purposefully selected students from three public sector universities to serve as respondents for this research. The public sector universities include the UoB, SBK and BUIITEMS which are located in Quetta city. We selected students from public sector universities based on the following criteria. Firstly, they represent the general public of Quetta city. Secondly, they represented all households of low, middle and high income which made the sample more representative.

**Table 1. Description of Universities**

S/N	Universities	Status
1.	University of Balochistan (UoB), Quetta	Public
2.	Sardar Bahadur Khan Women, University (SBK), Quetta	Public
3.	BUIITEMS University, Quetta	Public

Source: Primary data, 2022

### ▪ Stage 3

In the stage 3, the simple random sampling was used for selection of the sampled respondents from the Bachelor of Science (BS), the Master of Science (MS), the Master of Philosophy (M.Phil.) and the Doctor of Philosophy (Ph.D.) programs.

## 2.8. Data analysis methods

Descriptive statistics was used for descriptive analysis of the data collected through a questionnaire survey from respondents.

## 2.9. Inferential statistics

### 2.9.1. Binary Logistic Regression

In this study, we employed a logistic regression model to analyze the willingness to pay for waste disposal among households. The model is expressed as follows:

$$P(\text{Willingness to Pay} = 1) = \frac{1}{1 + e^{\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n}} \quad \dots \dots \dots (1)$$

$P(\text{Willingness to Pay}=1)$  is the probability of households expressing a willingness to pay for waste disposal.  $X_1, X_2, \dots, X_n$  represent the independent variables associated with the household characteristics and attitudes.  $\beta_0, \beta_1$

$\dots, \beta_n$  are the estimated coefficients for the respective independent variables.  $e$  is the base of the natural logarithm. The logit function, the inverse of the logistic function, transforms the probability into log-odds:

$$\text{logit}(p)=\ln(1/1-p)=\beta_0+\beta_1X_1+\beta_2X_2+\dots+\beta_nX_n$$

These coefficients ( $\beta_0, \beta_1, \dots, \beta_n$ ) were estimated using maximum likelihood estimation, providing insights into the relationship between household characteristics and the probability of expressing a willingness to pay for waste disposal.

This study has used both descriptive and inferential analysis methods. The statistical methods used in this research consisted of descriptive statistics of frequency counts, percentage, mean, and standard deviation. For descriptive data analysis, mean and standard deviation were calculated. Whereas, for inferential analysis, the binary logistic regression model was used to explore the relationships between willingness to pay for improved solid waste management service and the socio-demographic characteristics.

### 3. RESULTS

#### 3.1. Descriptive Statistics of Respondents

The findings in Table 2 showed the socio-demographic profile of the respondents in Quetta city. The majority of the respondents belong to the age group below 45 years old. Out of the total, 71.0% were male and 29.0% were female respondents. With regard to education, 6.0% were illiterate, 5.0% belonged to primary class, 10.0% to middle class, 12.5% to matric, 13.0% to inter, 42.3% to bachelor, and 11.3% to master. The family size of the respondent was <6 (16.0%), 11-16 (57.8%), between 12 and 17 (13.0%), and 18+

(13.3%). The family type of the respondent was single (39.8%), and 60.3% belonged to a joint family system. House type of the respondent: 75.0% owned their personal house, and the remaining 25% were living in rented houses. The average monthly income groups of the respondents were <40000 (12.3%), 40000–69999 (28.5%), 70000–99999 (36.5%), and 100000+ (22.8%), respectively. The majority (54.8%) of the respondents were found to be aware of solid waste, and 45.3% were not aware of solid waste. 54.3% of the respondents had public bins near their houses, while 45.8% of the respondents had no public bins near their houses. 55.3% of the respondents had no access to door-to-door solid waste collection services, while 44.8% had access to door-to-door solid waste collection services. Of the total, half (50.0%) of the respondents were paying no money for the solid waste collection services, and the remaining half (50.0%) were paying for the services of solid waste collection. The findings of this study showed that the majority of the respondents were found to be considering solid waste collection as very important (37.8%), slightly important (31.0%), extremely important (13.3%), not important at all (10.3%), and moderately important (7.8%), respectively. The majority of the respondents reported the current state of solid waste collection services as poor (48.5%), fair (23.3%), neutral (21.8%), excellent (8%), and good (5%), respectively. Moreover, out of the total, 36.5% of the respondents were satisfied by the MCQ waste management practices, 27.8% were neutral, 19.5% were very satisfied, 13.3% were dissatisfied, and 3.0% were very dissatisfied, respectively.

Table 2. Socio-demographic profile of the respondents

Socio-demographic profile	Frequency	Percent
<b>Age of respondents</b>		
< 25	189	47.3
25 - 34	86	21.5
35 - 44	114	28.5
45+	11	2.8
<b>Gender</b>		
Male	284	71.0
Female	116	29.0
<b>Education level</b>		
Illiterate	24	6.0
Primary	20	5.0
Middle	40	10.0
Matric	50	12.5
Inter	52	13.0
Bachelor	169	42.3
Master	45	11.3
<b>Family Size</b>		
< 6	64	16.0
6 - 11	231	57.8
12 - 17	52	13.0
18+	53	13.3

Socio-demographic profile	Frequency	Percent
<b>Family type</b>		
Single	159	39.8
Joint	241	60.3
<b>House Type</b>		
Personal	300	75.0
Rented	100	25.0
<b>Average monthly income (in PKR)</b>		
< 40000	49	12.3
40000 - 69999	114	28.5
70000 - 99999	146	36.5
100000+	91	22.8
<b>Having awareness proper waste disposal</b>		
No	181	45.3
Yes	219	54.8
Total	400	100.0
<b>Having public bins near your house</b>		
No	183	45.8
Yes	217	54.3
<b>Having access to door to-door waste collection service</b>		
No	221	55.3
Yes	179	44.8
<b>Currently paying for waste collection services</b>		
No	200	50.0
Yes	200	50.0
<b>Important of solid waste disposal</b>		
Not Important At All	41	10.3
Slightly Important	124	31.0
Moderately Important	31	7.8
Very Important	151	37.8
Extremely Important	53	13.3
<b>Perception of current state of solid waste collection</b>		
Poor	194	48.5
Fair	93	23.3
Neutral	87	21.8
Good	23	5.8
Excellent	3	.8
<b>Satisfaction with MCQ's waste management practices</b>		
Very Dissatisfied	12	3.0
Dissatisfied	53	13.3
Neutral	111	27.8
Satisfied	146	36.5
Very Satisfied	78	19.5
Total	400	100.0

Source: Field Survey, 2022

Note. PKR= Pakistan Rupee (The national Currency of Pakistan)

### 3.2. Disposal of collected waste

The results in Table 3 showed the disposal of collected waste in Quetta City. The highly reported disposal of collected waste was found in general public meetings

with 50.3% responses. The second highly reported collected waste was found in an open space, with 21.5% attended by respondents. Moreover, in the itinerant waste van (8.5%), by the roads (5.8%), not applicable (4.0%), in a hole (3.0%), others (7.0%), and others.

Table 3. Disposal of collected waste (Multiple Responses)

Disposal of collected waste	Frequency	Percent
Not applicable	16	4.0
In the public bin	201	50.3
In the itinerant waste van	34	8.5

Disposal of collected waste	Frequency	Percent
By the road or street side	23	5.8
On an open space	86	21.5
In a hole/in own compound	12	3.0
Others	28	7.0
Total	400	100.0

Source: Field Survey, 2022

### 3.3 Willingness to pay for improved solid waste management

The findings in Table 4 reveal the willingness to pay for improved solid waste management in Quetta City.

A little more than three-fourths (76.5%) of the respondents were willing to pay, whereas 23.5% were not willing to pay.

Table 4. Willingness to pay to ISWM

Willingness to pay to ISWM	Frequency	Percent
No	94	23.5
Yes	306	76.5

Source: Field Survey, 2022

### 3.4. Results of regression analysis

The logistic regression analysis on households' willingness to pay for improved solid waste management (ISWM) waste results are mentioned in Table 4.23. Age emerges as a significant determinant, with a clear trend of increasing willingness to pay with increasing age. Specifically, individuals aged 25–34, 35–44, and 45 and above are 3.77, 5.76, and 5.21 times more likely, respectively, to express a willingness to pay compared to those under 25. Gender plays a distinctive role, indicating that females are 5.72 times more likely than males to express a willingness to pay for water disposal, which is significant at  $p\text{-value} < 0.05$ . Educational attainment exhibits a compelling relationship with willingness to pay. Notably, individuals with educational levels beyond the baseline of being illiterate demonstrate a substantial increase in their likelihood to contribute their WTP. The coefficients for educational categories such as matric, inter, bachelor, and master are all statistically significant ( $p\text{-values} < 0.01$ ), underlining the importance of

education in shaping attitudes toward WTP for waste disposal. Family dynamics also play a crucial role. Households in joint family setups are 4.29 times less likely to express a willingness to pay compared to those in single-family structures. The type of housing is another factor of influence, as individuals living in rented houses are 2.42 times less likely to express willingness compared to those residing in their own homes. Monthly income levels demonstrate varying effects on willingness to pay. While the coefficients for income groups of 40,000–69,999 and 100,000 and above are not statistically significant, the group with an income range of 70,000–99,999 shows a noteworthy positive association, indicating a higher likelihood of expressing willingness to pay. Furthermore, the inclusion of education on waste disposal as a variable demonstrates its positive impact on willingness. Individuals with education on waste disposal are 2.61 times more likely to express a willingness to pay. The overall model fit is robust, supported by the highly significant Likelihood Ratio chi-square test (LR chi<sup>2</sup>), a high Pseudo R<sup>2</sup> value (0.905), and a log likelihood of -20.527.

Table 5. Results of the regression analysis on willingness to pay for improved solid waste management

Variables	Coefficient	Std. err.	P-value	95% Conf. Interval	
<b>Age (years)</b>					
<25	Ref.				
25 – 34	3.77	1.72	0.028**	0.397	7.155
35 – 44	5.76	1.99	0.004***	1.855	9.667
45+	5.21	2.47	0.035**	0.357	10.071
<b>Gender</b>					
Male	Ref.				
Female	5.72	2.21	0.01**	1.378	10.076

Variables	Coefficient	Std. err.	P-value	95% Conf. Interval	
<b>Education level</b>					
Illiterate	Ref.				
Primary	-0.81	2.12	0.702	-4.988	3.360
Middle	-0.154	2.87	0.957	-5.784	5.474
Matric	5.833	2.15	0.007***	1.617	10.050
Inter	12.48	4.22	0.003***	4.203	20.767
Bachelor	11.42	3.05	0.000***	5.437	17.402
Master	10.825	3.374	0.001***	4.211	17.439
<b>Family type</b>					
Single	Ref.				
Joint	-4.29	1.96	0.028**	-8.144	-0.452
<b>House type</b>					
Own House	Ref.				
Rented	-2.42	1.421	0.088*	-5.211	0.359
<b>Average monthly income (PKR)</b>					
<40000					
40000 - 69999	3.76	2.510	0.134	-1.154	8.687
70000 - 99999	5.63	2.64	0.033**	0.446	10.822
100000+	5.59	2.94	0.058*	-0.189	11.371
<b>Awareness on waste disposal</b>					
No	Ref.				
Yes	2.61	1.43	0.068*	-0.191	5.421
<b>Having public bins near homes</b>					
No	Ref.				
Yes	-0.90	1.24	0.466	-3.349	1.534
<b>Dispose Household SW</b>					
No	Ref.				
Yes	-0.60	1.44	0.677	-3.426	2.223
<b>cons</b>	<b>-8.90</b>	<b>3.13</b>	<b>0.005</b>	<b>-15.052</b>	<b>-2.757</b>
<b>LR chi2(18)</b>	<b>395.14</b>				
<b>Prob &gt; chi2</b>	<b>0.000</b>				
<b>Pseudo R<sup>2</sup></b>	<b>0.905</b>				
<b>Log likelihood</b>	<b>-20.527</b>				

Source: Field Survey, 2022

\*significant at 10%, \*\*= significant at 5%, and \*\*\*=Significant at 1%.

Abbreviations. MSWM= Municipal Solid Waste Management

**Table 6. Suggestions by respondents for improving solid waste management in Quetta**

S. No	Suggestions	Frequency
1.	MCQ should make a proper solid waste management strategy covering each area	61
2.	Waste should be disposed off on daily basis by MCQ's human resource	23
3.	MCQ should prioritize the waste disposal in municipal services delivery	22
4.	MCQ staff needs to be trained for professionalism and honesty	20
5.	MCQ should devise and follow the clean city strategy	15
6.	Expansion of installing solid waste bins across the metropolitan area	13
7.	Establishment of recycling system for municipal solid waste	7
8.	MCQ should initiate awareness campaigns for safe solid waste disposal	5
9.	I do not know and have no idea	5
10.	Regular cleaning of public dustbin by MCQ	5
11.	MCQ needs to enhance its sewerage system to eradicate unpleasant smells.	2
12.	Workforce expansion needed at MCQ	2
13.	MCQ should enhance solid waste collection services.	2
14.	Establishment of waste segregation mechanism at source	2
15.	Government should provide financial and technical resources to MCQ	2
16.	MCQ should follow waste reduction strategy	2
17.	MCQ should adopt advanced waste collection practices.	1

S. No	Suggestions	Frequency
18.	The existence of solid waste on the street poses a significant hazard.	1
19.	MCQ should ensure employee amenities.	1
	Total	191

Source: Field Survey, 2022

### 3.5. Suggestions on improving the solid waste management

Table 6 presents suggestions from 191 respondents regarding solid waste management, revealing strong public concern about its health and environmental impacts. The most frequently cited issue, mentioned by 32 respondents, was the link between solid waste and disease, underscoring widespread awareness of public health risks. Closely following, 31 individuals pointed out broader environmental and health hazards associated with poor waste management, while 25 respondents emphasized the importance of proper collection for maintaining cleanliness. Recycling also emerged as a significant theme—24 respondents called for the adoption of recycling practices, and 14 recognized its potential to generate new products. A smaller number highlighted additional benefits of recycling, such as income generation and environmental protection. Other concerns included water pollution (5 responses), sewer blockage (3), and gas emissions (1). Notably, 9 respondents viewed solid waste as unimportant, and 3 admitted uncertainty. Overall, the responses reflect a strong consensus on the importance of effective waste management, with emphasis on health, environmental, and economic dimensions.

## 4. DISCUSSION

This study has assessed the households' willingness to pay for improved solid waste management in Quetta, Balochistan. The swift rise in the amount of solid waste is becoming a significant environmental issue in the developing countries (Khattak et al., 2009). destroying human health and stimulating ecological, financial, and natural harms due to poor management of solid waste in developing cities (Akhtar et al., 2017) Therefore, there is a pressing need for improved solid waste management because of its major environmental and public health implications.

Our findings showed the sociodemographic profile of the respondent in Quetta City, where the majority of the respondents were youth and quite mature, and most of them were male, and somehow females too, as the data has been collected from universities and the

business sector. Similar findings are reported by Akhtar et al. (2017).

The majority of the respondents to this study were students of different universities in Quetta city, mostly bachelor's and master's degree students, and most of them were part of large families, as the people of Quetta city mostly live in joint family systems. The study of Macau University showed the interviewees were 38.96 years old, and just 33.33% of the respondents were male. Besides this, the average number of household members was 3.70, and the education status was high school (Song et al., 2016a). The findings of this study revealed that the majority of the respondents are part of joint family systems, as most of the population of Quetta City lives in joint family systems as per their tradition, and a small number of these interviewees have single family systems. As Quetta city, where this study has been done, is a developing city where the majority of the population belongs to the middle class and somehow the upper class, the majority of these respondents who took part in this data belong to the middle class. The findings of our study are quite similar to Akhtar et al. (2017).

The findings of this study showed that the majority of the respondents were aware of solid waste management and its importance, and some number expressed their views that they were unaware of it, and the majority of them in this study found that they were thinking about this major issue regarding solid waste collection, which is very important, as it causes many problems. The same study showed that the majority of the respondents were concerned about the environmental problems in Macau, and most of the answers (80.8%) almost spent work on it (Song et al., 2016a).

Majority of the respondents of this current study found that, they are already paying money for the solid waste services, and expressed their concern about its environmental problems and wished to overcome it, and also wanted to play their role along the local government, whereas some respondents answered that, they are not concern about it, as this number of respondents showed that, the current state of solid

waste in this area is very poor and need to be boost up, but those who were paying money showed, its good even some showed its excellent, similar study revealed the findings, where the respondent were not happy as the waste management workforce is too small to active municipalities to attain their goals (Limon et al., 2020). Besides all these, a large number of the respondents of this study were pleased by the MCQ waste management practices, and some of them were neutral; the average respondent was very satisfied, and a small number of the respondents were dissatisfied (13.3%), and very few were dissatisfied, respectively, with solid waste management services, which need to be improved as soon as possible.

Our findings showed that highly reported disposal of collected waste was founded in general public bins, and a small amount of collected waste was found in open spaces such as roads, grounds, streets, and even in drains, about which everyone knows its negative effects and environmental disasters. Similar studies are reported. Everybody knows the negative effect of unlawful waste dumping, throwing it into disaster, the effect of burning waste, putting aside organic-inorganic waste, or permitting it to pile up in public places (Brotosusilo et al., 2022). Moreover, 8.5% were in the itinerant waste van, 5.8% were found on roads, 4.0% were not even applicable, 3.0% were found in a hole, and 7.0% were others. For waste disposal, 45% of respondents chose landfill and 12.5% chose burning (Akhtar et al., 2017). To establish an effective solid waste management system, it is crucial to immediately stop the practices of open disposal and open burning (Mukherji, 2018b).

Our findings revealed the willingness to pay for improved solid waste management in Quetta City, where the majority of our respondents were found willing to pay for solid waste services, while just a small number of respondents were not pleased to pay for the improved solid waste services. Some studies also reported that 63% of interviewers were willing to pay less than USD 48 for neighborhood cleaning, 18.5% refused to pay anything, 16% were willing to pay USD 4.8-9.7, and 2.5% were willing to pay over USD 9.54 (Akhtar et al., 2017). The study found that the majority of the interviewers expressed positive views on solid waste management, from the point they agreed with all the beliefs specified in the researcher-designed survey, resulting in an average rating of 1.08 (Limon et al., 2020).

#### **4.1 Limitaion of the study**

The current study has a few limitations. The majority of the respondents were university students representing households in the city with highly educated backgrounds. Although we tried to neutralize this effect of education by adding a little less than half of the respondents from the business sector, caution is needed in generalizing the findings of this study.

#### **5. CONCLUSION**

This research study on the willingness to pay for improved solid waste management services in Quetta, Balochistan, Pakistan, has produced important findings that have explored the current status of waste management and disposal services in the Quetta metropolitan city of Balochistan and also investigated households' willingness to pay for improved solid waste collection and associated factors in the Quetta metropolitan city.

The major findings of this study showed that the overall state of solid waste collection services in Quetta City is quite poor. This is due to lack of awareness about solid waste among masses, no proper education about solid waste collections, due to insufficient availability of dustbin at home, and due to poor management and strategy by MCQ. As there is no such public bins near houses, in case if there are public bins, then that is quite in distance, and these container are not getting empty properly by MCQ, and there is no sufficient public bins in metropolitan area to dispose solid waste safely, thus to sort out this major problems, MCQ should prioritize solid waste disposal, and adopt advanced waste collection services. Moreover, MCQ has to initiate proper campaign about solid waste disposal and should take well strategy about solid waste management. Similarly, the Government should take part to provide financial and technical resources to MCQ, and should provide sufficient and technical human resource to MCQ, above all these MCQ should follow waste reducing strategy.

The major findings of this study showed that, the problems that is caused by solid waste is air pollution, water pollution, smell and several health related problems and diseases, beside these problems, it also affect the environment, and there is a pronounced hazard on the street, just because of the presence of solid waste, and it caused harmful gases, because of rotting of solid waste, and these all happening, because there is no proper disposal strategy, no collection

services of solid waste on daily basis, no sufficient public bins for safely disposal, no social and public awareness campaign to educate people about the importance of solid waste collection, now to overcome these major problems. MCQ should start campaign to educate people through social media, through posters, through commercial advertizments, and making use of social platforms to aware people about solid waste collection, and MCQ should make strategy to reduce solid waste by implementing recycling mechanism, so that gain economic importance, because after recycling solid waste, new product could be produced to utilize for solid waste collection. Most importantly, MCQ should enhance solid waste collection services. Establishment of a waste segregation mechanism at the source will therefore sort out these said problems.

### 5.1. Policy implications

As the majority of the residents in Quetta City are willing to pay for ISWM services, this provides a great opportunity for municipal administration and policymakers to implement community-backed and sustainable reforms. These reforms could include the introduction of a use fee system, establishment of a municipal solid waste fund, and establishment of a mobile app for digital payments for improved solid waste management. Moreover, the introduction of public-private partnerships (PPPs) and the integration of informal waste collection with formal waste collection can surely improve the disposal of solid waste. Last but not least, mass awareness of safe waste disposal strategies and techniques at the community level, schools, colleges, and universities can surely result in improved solid waste management services.

### DECLARATIONS

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