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Effect of Waste Management Practices on the Quality of Life of Waste-pickers in Bangladesh: A Study in Sylhet City Corporation

Mohammad Nashir Uddin
Shahjalal University of Science and Technology
Md. Sofiulla Molla
sofiullamolla35@gmail.com

Shahjalal University of Science and Technology

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Abstract

Integrated Solid Waste Management Rules (ISWMR), 2021, was adopted and implemented in many cities and municipalities of Bangladesh. The principal purpose of this initiative was to overcome the complicated challenges of managing different categories of wastes such as compost, hazardous and plastic matters. However, this ISWM approach has been bitterly criticized for its limited achievement. Moreover, a good quality of life for the waste-pickers is needed for leading a healthy life. Hence, this research examines the existing waste management practices and its effects on the quality of life of the waste-pickers working for the Sylhet City Corporation. Therefore, the research applied a mixed methods research design with a concurrent approach. A semi-structured survey of the waste-pickers sampled using cluster random sampling was employed to collect quantitative data while key informant interviews, and in-depth interviews were employed to collect qualitative field data. Descriptive data analysis method as well as a combined method of thematic-interpretative analysis were applied to analyse raw data. Major findings of this study included that the local community organizations play the most important role in waste management practices at the primary stage. These organizations recruited waste-pickers and managed to pay wages and salaries of the workers in close cooperation of the households. In addition to that, there were only seven secondary transfer stations, lack of adequate transportation, and absence of recycling facilities were the major challenges for the Sylhet City Corporation (SCC). However, a pilot plant of material recovery with the cooperation of Holcim Cement Company, was working for the waste treatment. On the other hand, the quality of life of waste-pickers was found poor and scored 37 points on the scale of 100. Moreover, waste-pickers' safety measures, pollution control mechanisms, three-bin initiative, and remuneration had affected their quality of life.

1.Introduction

Managing a huge volume of waste produced by municipalities and cities has become an alarming dimension mostly in developing countries across the world (Ahsan et al., 2014; Islam, 2016; Ittefaq et al., 2023). Continuous migration of rural people to urban areas, increasing the growth of population and vast economic activities make the waste management activities more complicated in developing countries (Ahsan et al., 2014; Islam, 2016; Jayakrishnan et al., 2013). However, there are twelve city corporations in Bangladesh including Sylhet City Corporation. Sylhet City Corporation initially was started as the Sylhet Municipality in 1878 and begun its operation as the Sylhet City Corporation (SCC) on the 28 July 2002 (www.scc.gov). The total area of the SCC is 79.50 sq. km and comprises 42 wards with a population of approximately 1 million (www.scc.gov). In Bangladesh, most of the cities and municipalities produce a huge volume of wastes including household waste, human waste, medical waste, drainage, and sewerage while the capacity to manage that waste is too limited (Ahsan et al., 2014; Sharior et al., 2023). In addition to that, the scientific management of solid waste has always been ignored in Bangladesh (Ahsan et al., 2014). The overall managing pattern of solid waste in the city corporation is done in cooperation with the conservancy and engineering departments (Ahsan et al., 2014). But the present system lacks behind to face the challenges of managing huge amount of waste and the effect of those

on both the health of the workers and the environment as well (Ahsan et al., 2014; Islam, 2016; Sharior et al., 2023). However, city corporations along with the non-governmental organizations (NGOs) and the civil society organizations (CSOs) have been trying to adopt Integrated Solid Waste Management System (ISWM) (Ahsan et al., 2014). The SCC also followed the same steps as mentioned above (Ara et al., 2021; Islam et al., 2017; Sakib et al., 2011). In the SCC, there were 21 secondary waste stations, 223 waste related workers, 4 water tankers, 150 vans, 43 tractors, and 1 vacuum tanker. The city corporation generated 200–250 tons waste per day that were dumped at the Lalmatia disposal site --- a 7-acre dumping area (Islam et al., 2017). In the ultimate disposal area, the SSC used recycling process while other two of the 3Rs model were ignored (Sakib et al., 2011). In contrast, another two studies found that the SCC did not use 3Rs model (reducing, reusing, and recycling), and there was no initiative for implementing the 3Rs model (Ara et al., 2021; Islam et al., 2017). Whether the SCC practiced 3Rs model is now a matter of dilemma considering the findings of previous studies. Therefore, this study aimed at finding an actual solid waste management practice of the SCC.

The occupational safety and the security of the waste-pickers cannot be ensured by the conservancy department of city corporations in Bangladesh (Alam et al., 2022; Sharior et al., 2023). Waste-pickers in Bangladesh work without safety measures such as personal protective equipment and they work in a manual fashion in the septic tanks, drains and streets (Sharior et al., 2023). Waste-pickers have no personal protective equipment. Moreover, there are no initiatives available for maintaining hygiene practice in the workplace exposing them to various health hazards (Alam et al., 2022). They frequently suffer from dermal, musculoskeletal, and respiratory diseases. Among them, respiratory diseases are found predominantly (Chandra & Arora, 2018). A study conducted on street sweepers of the Dhaka City Corporation (DCC) found that only 13% of the waste-workers wear PPE and 40% of the workers are fatally infected by sharp objects and medical wastes (Kabir et al., 2015). Another study found that 74.4% of the workers had no knowledge of handling medical waste and 67.6% workers had negative attitudes toward medical waste handling process (Atakora & Stenberg, 2020; Millanzi et al., 2023). Eye diseases, nail infection and dermal problems are prevalent among the waste workers (Atakora & Stenberg, 2020; Jayakrishnan et al., 2013). Study found the workers who dealt with sharp metal become more exposed to hepatitis B virus (HBV) infection and it reported that the prevalence of HBV infection was 23% (Rachiotis et al., 2012). The research gap in this section is that no more studies focused on what measures were actually taken in the Waste Management Rules 2021 of Bangladesh for ensuring occupational safety and reducing physical health hazards in the workplaces. This study focused on and judged safety and health concerning issues by considering Waste Management Rules 2021.

Similarly, the mental health status and the psychological issues of waste-pickers remain unaddressed in academic research and policy practices (Monteiro & Nalini, 2021). Waste-pickers are suffering from identity crisis, but they wish to become a part of the mainstream society (Ittefaq et al., 2023). They feel stress and anxiety (Kisana & Shah, 2021). Hopelessness and the poor quality of their life are common phenomena (Hussian & Sharma, 2016). Minor Psychiatric Disorder (MPD) has very significantly affected the mental wellbeing of the waste pickers (Sara et al., 2022). A quantitative study, which measures the psychological wellbeing of waste-pickers, reported 80.6% psychological disorder, 92.6% social

disfunction and 19.9% loss of confidence (Haque et al., 2022). The situation became worse during Covid-19 when 81% of the waste-pickers reported psychological distress (Haque et al., 2022). Waste-picking jobs are considered as a poor quality or hated job, and they are often from the lower income groups. They are the victims of low self-esteem and social stigma that affects the mental wellbeing (Haque et al., 2022). Positive mental health has a great impact on the productivity, but marginalization based on occupation has negatively affect the mental health of women waste-pickers (Monteiro & Nalini, 2021). The psychological condition of the women waste-pickers was found worsen than those of the male worker during Covid-19 (Haque et al., 2022). Another study found that waste-pickers were more vulnerable to psychological wellbeing (Hussian & Sharma, 2016). A quotation from a study is "*why are you asking about tension? There is tension everyday*" (Kisana & Shah, 2021). The research gap in this section is that psychological condition of waste-pickers remains unaddressed in the academic research in Bangladesh.

Waste-pickers in most of the South Asian countries belong to the lower caste, mostly neglected, and live below the poverty line (Sharior et al., 2023). Waste-pickers are most vulnerable group in the third world countries like Bangladesh (Alam et al., 2022). They are often ignored, undervalued, and marginalized in society (World Bank, 2019). Historically, waste-pickers belong to the marginalized communities and due to the lack of state regulation, they were trapped in poverty (Kakar et al., 2022). Most of the South Asian societies like India, the task of collecting garbage is distributed based on caste identities. The community which engaged with waste and sanitation works is called *Dalit*, belong to the lower tier of the manmade hierarchy, often referred as untouchable (Kakar et al., 2022). *Dalit* communities are often forced to collect waste by avoiding other occupation (Kakar et al., 2022). *Safai Karmacharis* (waste-workers) are neglected in the civilized Aisn countries like India (Raghavendra & Kumar, 2022). Due to being scheduled caste, the waste-pickers have little hope for changing their profession. The leftover food in the restaurants and from home is often offered to the waste-pickers in a plastic and disposal plate rather than the plate that is being used for other people in society. They are also neglected in public places such as temples and religious festivals (Raghavendra & Kumar, 2022). Most of the waste-pickers live in the slums where they have no proper sanitation and drinking water facilities (Paul & Bhattacharjee, 2022). Research on the dignity of waste-pickers has not achieved much attention (WHO, 2022). Inequality and discrimination also existed among waste-pickers in Bangladesh compared to South Asian countries (Alam et al., 2022). Government has to take necessary initiatives for improving the quality of life for waste-pickers (Raghavendra & Kumar, 2022). In case of social dignity most of the studies reported that waste-pickers were marginalized, poor and neglected in the society (Raghavendra & Kumar, 2022; Kakar et al., 2022). Many studies were conducted in the Indian society since caste system makes the waste-pickers more vulnerable and marginalized (Raghavendra & Kumar, 2022). In Bangladesh, no significant literatures found on social dignity of waste-pickers. Therefore, this study aimed at judging the social status of waste-pickers in Bangladesh.

The aim of this study was to examine the effect of waste management practices on the quality of life of waste-pickers in Sylhet City Corporation, Bangladesh. To achieve the aim, this study specified the following objectives:

1. To explore the present status of waste management practices
2. To examine the quality [1]of life of waste-pickers
3. To find out the challenges of waste picking at different stages
4. To furnish potential policy recommendations to overcome the situation.

2. Materials and Methods

This study based on a pragmatic philosophical standpoint that fit best with mixed method research (MMR) approach combining both quantitative and qualitative approaches to ensure data validity, rigour, and trading off the inherent limitations of each single methodological strand (Tashakkori and Teddlie, 2010). An explanatory sequential process was followed where quantitative data were collected first by employing questionnaire survey design and then qualitative data were gathered by using interview checklist. This research was conducted in Sylhet City Corporation (SCC) area, one of the administratively significant and urban local government institutions (ULGIs) geographically located in the north-eastern Bangladesh.

To develop a comprehensive understanding of the research problem, this research conducted secondary data sources in addition to primary field data. Secondary sources included review of relevant academic and institutional literature, e.g., peer-reviewed journal articles, book chapters, conference papers, policy documents, and reports of government and non-government organizations. To collect primary data through an empirical study, 196 sample respondents were selected randomly from the 400 (four hundred) waste-pickers and the officials engaged in waste management practices at the SCC (the officials of conservancy and engineering departments). The sample size was determined by applying Cochran's formula[2]for sample size selection for known population (Cochran, 1977). Firstly, Sylhet City Corporation was divided into 4 (four) clusters based on large landfill, dumping ground and geographical. Secondly, 196 samples were surveyed to assess the quality of life of waste pickers (49 from each cluster). The survey used a scale named WHOQOL-BREF (26 items to assess physical health, psychological health, social relation, and environment) through Kobo Toolbox. In addition, for collecting qualitative data, 16 respondents (4 officials and 12 waste-pickers) were selected purposively through interviewing (IDIs and KIIs). A checklist was made before conducting interviews. Moreover, the researcher did a non-participant observation in order to ensure data triangulation.

Quantitative data were processed and analysed with the standard software SPSS in the form of several descriptive statistical techniques such as percentage and frequency distribution, mean, and standard deviation. It also used multiple linear regression to measure the association between waste management practice and the quality-of-life of waste-pickers. On the other hand, for analysing and presenting qualitative data, this study used a six-step thematic analysis model of Virginia Braun and Victoria Clarke (2006, 2013) that includes data familiarity, initial coding, themes searching, themes reviewing, themes naming, and reporting.

3. Results and Findings

3.1 Waste-pickers' Socio-demographic Profile

Table 1presents the waste-pickers' socio-demographic profile (n = 196). All of (100%) the respondents were male who were responsible for waste collection in the SCC area. Of the respondents' age group, the young-adults (aged 21–25 years) represented the highest number of the participants (45.9%), while the disparity between the two age groups, 15–20 years and 30 year-plus were 14.4%. The ratio of educational qualifications was the lowest among the participants who attended up to Class VIII, while the ratio was 28.6%, 31.7%, and 30.6% for participants who do not have any formal education, who could sign only, and attended Class I to VIII respectively. A significant proportion of the participants were single (33.7%). The ratio of the two major religious identity of the participants e.g., Islam and Hindu were 90:5 according to this particular study. The highest ratio of participants' monthly earnings, BDT 5000–10000 and BDT ≥ 10,000 was 66.3:33.7.

Table 1
Socio-demographic Profile of the Waste-pickers

Attributes	Frequency	Percentage (%)
Gender		
Female	00	00
Male	100	100
Age (years)		
≤20	22	11.2
21–25	90	45.9
26–30	26	13.6
≥30	58	26.6
Educational Qualification		
No formal education	56	28.57
Can sign only	70	35.71
Class 1–8	60	30.61
Above class 8	10	5.10
Marital Status		
Married	124	63.3
Unmarried	72	36.7
Religion		
Islam	186	94.9
Hindu	10	5.1
Income (BDT/monthly)		
5000–10000	130	66.3
≥ 10000	66	33.7
Source: (Field Survey, 2024)		

3.2 Waste-pickers' Satisfaction with Waste Management Practices

Table 2 elucidates the level of waste-pickers' satisfaction about the waste management practices (WMP) in the SCC. The waste pickers were happy when the three-bin initiative was first introduced since

more than half (54.1%) of the participants were satisfied. The percentage of waste-pickers' who were dissatisfied with transportation services was higher than any other category (81.6%), whereas the disparity among participants fluctuated nearly from 58 to 65% regarding their dissatisfaction. Then, the ratio of highly dissatisfied waste-pickers with remuneration and compensation stood at first position (33.7%), as opposed to the three-bins (0%), while other categories fluctuated approximately 27%.

Table 2
Satisfaction Level of the Waste-pickers

Waste management practices	**Satisfaction with Waste Management Practices**				
	Highly Dissatisfied (%)	**Dissatisfied (%)**	**Neutral (%)**	**Satisfied (%)**	**Highly Satisfied (%)**
1.Three bin/pots initiatives	0	0		54.1	40.9
2.Transportation services	0	58.2	36.7	5.1	0
3. Reduce, reuse, and recycle	11.2	81.6	4.1	2	1
4. Pollution control mechanism	32.7	59.2	6.2	4	2
5. Supervision pattern	26.5	61.2	5.2	6	1
6. Training programs	26.5	60.4	5.1	5	3
7. Working hours and workload	26.5	65.3	6.2	1	1
8. Safety measures in working place	29.6	63.3	7.1	0	0
9. Remuneration and compensation	33.7	59.2	7.1	0	0
Source: (Field Survey, 2024)					

3.3 Quality of Life of the Waste-pickers

Table 3 shows the number of participants, mean and standard deviation including minimum and maximum score. The mean values stated the actual condition of physical, psychological health, social and environment related issues that were 8.66, 8.02, 7.78 and 7.71 units respectively. The overall quality of life from these raw scores is the sum of mean of each variable, which was 31.17. Similarly, the second part of this table illustrates the converted raw score into transformed score by using WHQQOF-BREF user manual chart. It can be seen that social relationships were higher than any other category and stood at 25, whereas environment related score was 0. Physical and psychological scores were reported the same, which was 6. From each of four variables, the study found that quality of life score of waste

pickers was 37. In 0-100 scale, 0–25 = is very poor, 26–50 = is poor, 51–75 = is good, 75–100 = is good quality of life. Therefore, the quality of life of waste pickers was poor.

Table 3
Quality of Life of the Waste-pickers

Items of Satisfaction	Quality of Life Raw Score					Raw Score	Transformed Score
	N	Minimum	Maximum	Mean	SD		0-100
Physical health	196	6.86	10.86	8.66	.97	8.66	6
Psychological health	196	5.33	10.67	8.02	.87	8.02	6
Social relationship	196	5.33	17.33	6.78	2.36	6.78	25
Environment related	196	5.50	11.00	7.71	1.28	7.71	0
Overall Quality: Raw Score: 31.17						**Transformed Score: 37**	
Source: (Field Survey, 2024)							

3.4 Waste Management Practices and Waste-pickers' Quality Life

To detect and predict the relation of waste management practices and quality of life of waste-pickers, a multiple linear regression was conducted and reported in the following:

Table 4. The Effects and Relationships between Waste Management Practices and Quality of Life of Waste-pickers

Waste Management Practices	Quality of Life of Waste-pickers						
	B	SE	β	t	P-value (0.05)	95% CI for B	
						Lower	Upper
1.Three-bin/pot initiatives	-1.70	.543	.216	3.131	**.002**	.629	2.771
2.Transportation services	.287	.479	.043	.599	.550	-.658	1.232
3. Reduce, reuse, and recycle	1.278	.725	.139	1.763	.079	-.152	2.707
4. Pollution control mechanism	1.187	.453	.178	2.621	**.001**	.293	2.080
5. Supervision pattern	.571	.449	.088	1.272	.205	-.315	1.457
6. Training programs	-.477	.513	-.063	-.930	.354	-1.48	.535
7. Working hours and workload	-.068	.514	-.010	-.133	.895	-1.08	.946
8.Safety measures in working place	2.287	.489	.387	4.660	**.001**	1.313	3.244
9. Remuneration and compensation	1.970	.507	.292	3.888	**.001**	.971	2.970

Table 4 shows the effects of management practices considered nine different areas on quality of life. At the very outset, several models were tested to ensure the assumption of linearity, multi-collinearity, normality and homoscedasticity. First, scatter plot of residuals and normal probability plot of standardized residuals in response to standardized predicted values ensured that the assumption of linearity, homoscedasticity and multi-collinearity were not violated in this analysis. Secondly, *Mahala Nobis* distance, at critical value χ^2 for degree of freedom 9, is 27 which also met in this analysis and ensured that multivariate outliers were not interfered in predicted values. Overall, the multiple regression reported that management practices were 24.6% accounted for variability of quality-of-life score of waste-pickers [R^2 = .246, adjusted R^2 = .209, p<.001]. Among the nine management practices variables, four were found statistically significant with positive relations (p-value less than .005) such as three bins initiative, pollution control mechanisms, safety measures, remuneration and other financial benefits. Standardized coefficient beta (β) value for safety measure, remuneration and other financial benefits, three-bin initiatives, and pollution controlling measure indicated that if the score of each of the four variables is increase by one standard deviation, the quality of life score of waste-pickers would rise by .387, .292, .216, and .178 standard deviation units respectively.

3.5 Waste Management Practices (Officials' and Waste-pickers' Perspectives)

Waste Management practices include several stages: primary, secondary and ultimate disposal sites. In the primary disposal sites, local community welfare organizations co-operate with elected counsellors, recruiting waste-pickers for collecting waste from households. Waste-pickers either managed vans by themselves or distributed by volunteer organizations, which all were open vans to carry waste from households (where all kinds of waste were stored in a pot/bin and there was no separation of waste categorically). However, the SCC conducted a pilot program (in three of its wards) under the Solid Waste Management Rules-2021, for separating compost matters in green bins, recyclable waste in yellow bins and risky materials in red bins. This program failed due to lack of appropriate transportation services. One of the officials stated,

"We took this initiative for separating different kinds of waste and ensuring the best use through recycling. But this pilot program was declined due to unavailability of separate place in both opened and covered" (official-1).

After collecting all kinds of mixed waste through open vans from households, waste-pickers go to the secondary transfer station (STS). The waste management support from the city corporation started from secondary transfer stations. There were only seven secondary transfer stations across the whole city corporation, which were significantly less than the expected demands of 42 wards in the city. Besides these accredited STS, there were many informal secondary transfer stations, which caused air pollution and malodour. After that, only 30 compactor trucks and few open trucks were used to convey at least 250–260 tons of waste per day from STS to ultimate disposal sites. There was only one disposal site situated far away from the city area where waste treatment was held. Finally, the city corporation made Annual Waste Report within 30 September in every fiscal year including pros and cons of waste management.

3.5.1 Waste Treatment

There was no formal waste treatment such as recycling, reducing and reusing process in SCC. However, informal recycling by the waste-pickers at the primary and secondary stages were considered significant. A pilot joint venture by the city corporation and the Lafarge Holcim Cement Company known as Materials Recovery Plant was found under trial in *Chatok* cement factory where polythene and plastic materials were used as clinker (an element for making cement). All of the officials were of the view that,

"Presently we have no recycling procedure for waste treatment, but we are hopeful about Material Recovery plant in Chatak cement factory which uses 60–70 tons plastic and polythene per day for making clinker" (Official 1,2,3,4).

3.5.2 Monitoring and Environment pollution Control

Monitoring at central and field levels was done by the city corporation to ensure the proper management of waste and accountability in the workplace. The waste management department appointed field supervisors in each of the secondary transfer stations but there was no supervisor in the informal

stations, which were majority in number. In order to control malodour and environmental pollution in both primary and secondary disposal stations, waste departments spray bleaching powder. However, the waste-pickers said,

Sometimes we got bleaching powder from waste department and spray in the accredited secondary transfer stations, but never in the informal secondary transfer stations which were mainly spreading malodor across the city corporation area

3.6 Working Conditions, Remuneration and Financial benefits

City corporation has been maintaining waste management activities through contractual workers (daily basis salary and if anyone is absent, will not be considered for salary) well known as muster roll waste-pickers performing their duties in three shifts, 8 hours each. In the daytime, they collect waste from secondary stations that come earlier from households, whereas at night they collect waste from government (deputy collector and courts) offices. Muster roll waste-pickers got BDT 500 per day, extra pay for overtime and two EID bonuses. Similarly, a compensation package was offered for these who become the victim of any accident that happened in the workplace. During the absences due to accident, the authority gave them regular attendance. There was no pension scheme for muster roll waste-pickers. After the commencement of new pension scheme known as “Universal Pension Scheme” by Bangladesh government, the city corporation included them under ‘*Samata scheme*’. One of the officials stated,

We brought them under the ‘Samata scheme’ according to the government direction and they were supported to deposit BDT 500 per month. (Official – 1).

On the other hand, non-muster roll waste-pickers appointed by the local community organizations performed their duties during the daytime. There was no specific timeframe to complete the task. Hence, they did it at any reasonable time and their working hours depended on the number of households they covered. They got their salary from community organizations, which varied from one another between BDT 10000 to 15000 per month. They did not get any bonus, compensation and were not included under ‘*Samata scheme*’ of Universal Pension. One waste-picker stated,

“We do not get proper salary, bonus and pension from community organizations and discrimination also exists among the organizations” (worker-5).

3.7 Organizational Capacity and Challenges

Old organograms, limited office space, insufficient income sources, and lack of sufficient transportation facilities were commonly found challenges in the SCC. In the organizational hierarchy, only the chief executive officer stayed at the top level, whereas the rest of the employees were at the bottom level, middle level was totally absent. Besides, due to the lack of infrastructural capacity, waste management department has been performing their duties within limited space. Correspondingly, there was

insufficient financial support from government and limited income sources in the city corporation area, which made imbalance between citizens' demand and services provided. One official stated,

"SCC has only limited income sources within the city corporation area comparing the other city corporations like Dhaka and Chittagong, which is why SCC requires more government support" (Official-1)

Moreover, SCC suffered from insufficient transportation opportunities. An assessment was conducted by the city corporation to estimate the number of vans required to cover the whole city found that, total required vans were 864 units, but the city corporation owned 244-unit vans and 30 compactor trucks. Furthermore, there were 42 wards in SCC, which required 42 secondary transfer stations, but only 7 STS were found in the area. One of the officials stated,

"We have conducted an assessment to determine the number of secondary transfer stations and dustbins, we found that required numbers of STS were 42 and dustbins were 8000, while we have 7 STS and 1500 dustbin respectively." (Official – 2)

In addition to that, the waste management department needed to co-operate with the engineering department for the maintenance of compact trucks and other vehicles. Sometimes lack of cooperation between two departments causes service delays.

3.7.1 Public Awareness Building

Building public awareness was found the most significant challenge for city corporations because without changing the people's attitudes toward obeying rules, it is quite impossible to practice effective waste management. As a part of Solid Waste Management Rules-2021, the city corporation started a pilot project in 3 wards to store different types of waste in green, yellow and red bins, but people started to store rice and wheat in these bins. Likewise, people did not want to pay the charge for services to the waste-pickers on time, which consequently, made them apathetic to collect waste from households. One of the officials stated,

"Naturally there are many canals (Chora) situated around the SCC. However, people preferred to throw the bag of waste into the Chora instead of storing them in the dustbin" (official-3)

In addition to, perishable bags were provided to city dwellers during *EID-UL- AZHA* (Muslim religious festival) for storing the waste of animals, but they were started to use these bags for covering their blanket (Official – 1)

3.8 Planning for Better Services in Future

Establishing secondary transfer station, extending the existing disposal sites, buying modern waste separation machines, adding new vans to cover whole area, establishing materials recovery plant, producing biogas and electricity were found crucial initiatives under the theme of planning for better services in future. Firstly, SCC was planning to build secondary transfer stations in each ward, whereas

only 7 STS were working to cover the whole area. Secondly, extending the existing disposal site and building new disposal sites for ensuring better treatment, management of waste and environmental protection. Thirdly, one of the officials reported, at present, the waste separation machines were not working properly as these were old-fashioned. Regarding the issue of buying new vans, one the officials stated,

We are planning to buy 540 new covered vans to collect wastes from the households incorporating with public and private entities such as Chevron and Dutch Bangla Bank" (Officials-1)

Furthermore, SCC was also planning to build material recovery plants for ensuring recycling, reducing and reusing plastic, polythene and sharp materials. As a part of this initiative, a pilot joint venture between city corporations and Lafarge Holcim Cement Company was undertaken to build materials recovery plant which covered 60–70 tons polythene and plastic into clinker per day in Chatok cement factory. Additionally, perishable bags (will be perished within 2 years) were already introduced primarily and are planning to extend the whole area to protect the soil pollution. Eventually, the city corporation was planning to ensure the best use of compost and organic matters in the ultimate disposal site. Regarding this, one of the officials stated,

"We are planning to produce biogas and electricity from compost and organic matters in the ultimate disposal sites" (Official- 1).

3.9 Quality of life of Waste-pickers

This section elucidates the quality of life of waste-pickers from their perspectives, which covers the physical health conditions, psychological well-being, social relationships and living environments. Sequentially, these are discussed based on themes and sub-themes:

3.9.1 Physical Health Status

Cold, cough, fever, physical pain and discomfort were frequently associated with waste- pickers' daily life. They regularly worked in unhygienic and unhealthy conditions, encountered decomposing matters and airborne pathogens, which made them vulnerable to respiratory infections, led to regular cold, cough and fever. However, lack of personal protective equipment in the workplace exacerbated these symptoms. One of the waste pickers stated,

"We must work during both the rainy and sunny days, but we have no raincoat. Besides, in the secondary transfer stations, there are no sufficient water supply facilities to wash our hand" (waste picker – 4).

Moreover, working long hours with physically demanding activities such as operating loaded van, bending and lifting waste to compactor trucks led to physical pain (back and joint pain) and discomfort among the waste-pickers. Furthermore, the most common and immediate risks associated with waste-pickers were injuries from sharp objects such as broken glass, needles, rusted metal and hazardous

materials. Due to lack of hand gloves and proper equipment, hands and feet were vulnerable to cuts and puncture wounds. One of the waste-pickers stated,

"Cutting hands and legs are very common phenomenon among waste-pickers due to lack of hand gloves and gum boots, and injuries infected rapidly because of the unhealthy working conditions" (waste picker-8)

Additionally, the harmful gases emitted from the decomposing wastes in the long-run cause respiratory diseases such as asthma. Besides, eye diseases, chronic diseases such as hypertension, heart problems, nail infections and dermal problems were prevalent among the waste-pickers in SCC.

3.9.2 Mental Health Status

Identity crisis, hopelessness, less confidence, low esteem, negative feeling, anxiety and depression were common among waste-pickers in the SCC. Due to the informal and unrecognized nature of their job, waste-packers were treated unfairly as unclean, uneducated entities in society, which exacerbated the term identity crisis among waste-pickers, despite of their crucial contributions in environmental sustainability. One of the waste pickers stated,

"Due to occupational stigma, we do not get respect in the society which ultimately leads to feel of identity crisis" (waste-pickers – 8).

Moreover, low income and financial insecurity propelled them to lead a life below the poverty line, and they could not fulfil their basic needs. Such economic unstable situation fosters the feeling of hopelessness among waste-pickers, as they did not see the specific ways to get rid of these circumstances. Besides, low self-esteem was prevalent among waste-pickers because societal reproach and lack of formal education internalized the sense of unworthiness, resulting in low self-esteem. Furthermore, negative feelings such as sadness, shame and worthlessness were frequently found among them. Such negatives feeling often nurture moderate to severe depression and anxiety. Despite their negative feelings about their job, they did it regularly. As one of the waste-pickers stated,

"Why are you asking about tension? Tension is a common phenomenon here. Despite of tension and negative feelings, we go to our work because this is our only sources of income and livelihood" (waste pickers-10)

Additionally, depression and anxiety were the silent weapons among waste-pickers because they were frequently reported about sadness, apathetic toward work, and lack of energy.

3.9.3 Social Relationship Status

Neighbours' attitudes and overall people's attitudes were found to have a significant category under the social relationship of waste-pickers in SCC. The study found a positive relationship about surrounding of waste-pickers such as personal relationships with friends, families and neighbours. They got all kinds of social support from their neighbours and could easily participate in social, cultural and religious festivals. However, people's attitudes toward them were found totally negatives. They were treated as

neglected, undervalued, marginalized and lower classes. During the collection of waste from households, more than 80% of people showed negative attitudes toward waste-pickers. When people seen waste-pickers in streets along with their heavily loaded vans, people changed their roadsides. One of the waste pickers stated that,

“We are working for the people, but they neglect us. Peoples want clean, neat and tidy roads and houses, but they do not clean their minds and attitudes” (Waste pickers-5)

Besides, waste-pickers were treated as informal workers, and they had no social and professional recognition. Another waste-picker stated,

“We do not get respect in the society due to our occupational stigma, but we are significant entities to make clean our society. However, we want professional recognition from government and society” (waste pickers – 12).

Additionally, this study found hereditary relationships regarding the profession of waste picking such as father transfers their duties to their children, and children to their children and finally the cycle restart. The study found some waste-pickers from other districts did not let their family to know what they did in Sylhet. On the other hand, the conditions of the living area of the waste-pickers were very poor. The lack of pure drinking water, unhealthy sanitation, little and congested living rooms were common features among the living area of waste-pickers. One of the waste pickers stated,

“We clean the roads, households waste and make the city a better place for living, but we live in an unhealthy environment which is another birthplace of infectious diseases” (waste-pickers-7).

4. Discussion

The main objective of this study was to examine the waste management practices and its effects on quality of life of waste-pickers in SCC. To find out the main objective this study broadly studied the present waste management practices in SCC and assessed the quality of life of waste- pickers by using the World Health Organization Quality of Life-BREF questionnaire. The previous sections broadly presented the waste management practices and quality of life of waste-pickers. This section integrated both qualitative and quantitative findings and made a comparison and contrast of major findings from participants’ point of view and evidence from existing literature and theories.

4.1 Present Status of Waste Management Practices

Waste-pickers’ knowledge and satisfaction about several aspects of waste management practices (quantitative) and stages of waste collection and treatment from primary to ultimate disposal sites (qualitative) are included under waste management practices. This study found that all of the participants (196) were knowledgeable about recycling, pilot program of 3 bins, pollution control, training, remuneration and compensation. Regarding the satisfaction of waste-pickers, the study

reported that around 95% of participants were satisfied with the initiation of three bins (green, yellow and red) pilot program. Because this initiative reduced the risk of cutting body parts (e.g. hands and feet), as well as the waste pickers introduced the process of recycling at the sources. However, this attempt failed due to the absence of separate places in both the open and covered vans to carry three types of waste from household to ultimate disposal site. Similarly, lack of public awareness was also responsible for this cut in a sorry figure. In fact, steps of waste management practices included primary stage, secondary stage, ultimate disposal site and waste treatment. Similar results were found by another study. It mentioned 5 steps of collection of wastes: (i) from source storage (household, hospital, market, street, office), (ii) on-site Storage (the secondary sources/station in which waste is shifted/transfer from primary sources to ultimate disposal sites), (iii) transportation (after collecting waste from secondary sources it has to carry to ultimate disposal sites), (iv) ultimate disposal Sites (where waste is stored and treated), and (v) minimization and treatment (reducing, reusing, recycling, and composting) (Ahsan et al., 2014). In the primary stage, local community welfare organizations along with the cooperation of elected counsellors, recruited waste pickers for collecting waste from households (Ahsan et al., 2014; Alam & Qiao, 2020). The support from City Corporation regarding waste management started from secondary transfer stations. There are only seven accredited secondary transfer stations for covering the whole city corporation, which contrast with the findings of Islam et al, (2017). They reported that in SCC there were 21 secondary waste stations. This paper might have counted all formal and informal secondary transfer stations, but formally, there are seven secondary transfer stations. Finally, SCC made an Annual Waste Report within 30 September in every fiscal year including pros and cons relating to waste management.

On the contrary, waste-pickers dissatisfactions (90%) were reported in this study regarding the waste treatment (recycling, reducing, and reusing) in SCC. Additionally, this study found that there were no formal waste treatment activities; rather there was informal recycling by waste-pickers in STS. This was supported by two studies which demonstrated that SCC did not use 3Rs model (reduce, reuse and recycle) and there was no initiative for implementing 3Rs model (Ara et al., 2021; Islam et al., 2017). SCC used only informal recycling processes except other two of the 3Rs model (Sakib et al., 2011). However, officials reported that the SCC and Lafarge Holcim Cement Company (well known as Materials Recovery Plant) took a pilot joint venture under trial in Chatok cement factory where polythene and plastic materials were used as a clinker (an element of making cement).

Most of the participants were dissatisfied with both the monitoring system and environmental pollution control mechanisms in the SCC (59.2%). This study found that waste management department appointed field supervisors under each secondary transfer station but no supervisor in the informal stations. Other studies also demonstrated that waste-pickers works under informal supervision (Ahsan et al., 2014; Islam, 2016). However, to control malodour and environmental pollution in both primary and secondary disposal stations, waste departments used to spray bleaching powder. But waste-pickers reported that informal stations never got such chemical, which was highly responsible for malodour in the streets and roadsides. Malodour was common in both primary and secondary transfer stations and there were no significant initiatives by the SCC (Kabir et al., 2015).

Waste-pickers' knowledge, skill and safety issues are vastly ignored in the workplace. This research showed that more than 60% of the respondents expressed their dissatisfaction with training and safety initiatives taken by SCC. However, the authority arranged weekly meetings with field supervisors, on-going discussion with workers and inspections during field visits but there was no formal training session for waste-pickers SCC. Another study showed similar results, which stated that there were no training facilities to make waste-pickers knowledgeable and skilled about their respective duties (Alam et al., 2022). Likewise, most of the waste-pickers reported that they had no safety equipment such as gumboots, masks, hand gloves etc. Moreover, previous study stated that, waste-pickers' safety and security could not be ensured by waste management department of the city corporation in Bangladesh (Alam et al., 2022; Sharior et al., 2023). Waste-pickers in Bangladesh work without taking safety measures such as personal protective equipment and work manually in septic tanks, drain and street (Sharior et al., 2023). Correspondingly, waste-pickers had no PPE and there were no initiatives for maintaining hygiene practice in workplace, which exposed them to health hazards (Alam et al., 2022). Subsequently, the first AID box facilities for ensuring safety of waste-pickers' health as per the Solid Waste Management Rules 2021 is absent in SCC.

This study found that most of the participants were dissatisfied with working conditions (65%) and remuneration (59%). Muster roll workers got BDT 500 per day as per their presence in the working area. On the other hand, non-muster roll workers got salary from local community organizations that ranked between BDT 10000 to 12000 per month. One of the previous literatures reported that formal waste-pickers got their salary from waste management department, while vehicle drivers paid by engineering department. The informal waste-pickers got their salary from local voluntary community organizations (Ahsan et al., 2014; Alam & Qiao, 2020). Additionally, muster roll waste-pickers were also included under '*Samata scheme*' of newly introduced Universal Pension Scheme. Correspondingly, muster roll waste-pickers got festival bonuses and accident compensation packages from city corporations, while non-muster roll workers remained deprived of such opportunities.

This study found several organizational limitations and challenges in waste management departments, which were responsible for insufficient delivery of services. Old organograms, limited office spaces, insufficient income sources, and lack of sufficient transportation facilities were prominently found in SCC. Another study demonstrated that, due to lack of proper planning, organizational capacity and financial stability, city corporation could not perform properly (Alam et al., 2022; Sharior et al., 2023). In the same way, the shortage of required vans such as 244 units in place of 864 units subsequently created over pressure on waste practices (Islam et al., 2017). On the other hand, the waste management department needed to co-operate with the engineering department for the maintenance of compactor trucks and other vehicles. Sometimes, lack of cooperation between two departments causes delayed services (Ahsan et al., 2014). Besides, building public awareness was found to be the most significant challenge for city corporations because without changing the people's attitudes towards obeying rules, it is quite impossible to practice effective waste management, for example, people throw bags of waste to canal *(Chora)* instead of storing in the bin

Future planning is necessary for improving the service quality of an organization. This study found several initiatives for improving waste management practices in SCC e.g., (I) establishing secondary transfer stations; (II) extending the existing disposal sites; (III) buying modern waste separation machine; (IV) adding new van to cover whole area; (V) establishing material recovery plant, and (VI) producing biogas and electricity were found as significant. City authorities were planning to build 42 secondary transfer stations in each ward, buy 540 vans in co-operating with private organizations such Chevron and Dutch Bangla Bank. Most significantly, they were planning to build formal recycling plants and produce biogas and electricity from organic matters.

5.2 Quality of Life of Waste Pickers

The overall quality of life score of waste-pickers comprising four dimensions such as physical health conditions, mental health conditions, social relationships and living environment is 37 in a scale of 100 which is labelled as poor quality of life. Previous literature reported the livelihood status of waste-pickers as poor and they live in an unhealthy environment (Paul & Bhattacharjee, 2022). However, this study found some elements of waste management practices impacted on quality of life of waste-pickers ($p<.005$) include three bins initiative, pollution controlling mechanisms, safety measures in workplace, remuneration and financial benefits. Overall, the study reported that management practices accounted for around 25% variability of quality-of-life score of waste-pickers ($R^2 = .246$, adjusted $R^2 = .209$, $p<.001$).

Regarding the physical health status of waste-pickers, this study found that they frequently suffered from cold, cough, fever, asthma, hypertension, physical pain and discomfort. Correspondingly, some other literatures concluded that the waste-pickers suffered from respiratory diseases, chronic disease such as asthma, hypertension, and heart diseases (Velasco Garrido et al., 2015; Alam et al., 2022; Sharior et al., 2023). Unhealthy and unhygienic working conditions caused infectious diseases among waste-pickers. Similar studies found that, working in garbage exposed the workers to many health risks and infectious diseases (Behnam et al., 2020; Bleck & Wettberg, 2012; Jayakrishnan et al., 2013; Jerie, 2016; Sara et al., 2022; Sharior et al., 2023). In addition, this study revealed that the most common and immediate risks associated with waste-pickers were injuries from sharp objects such as broken glass, needles, rusted metal and other hazardous materials. Kabir et al., (2015) reported that 40% workers were fatally infected by sharp objects and medical wastes. Besides, eye diseases, nail infections and dermal problems were prevalent among workers (Atakora & Stenberg, 2020; Jayakrishnan et al., 2013).

Mental and psychological well-being is essential for all individuals to lead a happy and healthy life. This study revealed that identity crisis, hopelessness, confidence loss, low esteem, negative feeling, anxiety and depression were common among waste-pickers. Some previous literatures concluded that hopelessness and poor quality of life were common phenomena among waste-pickers (Hussian & Sharma, 2016). Waste-pickers were suffering from identity crisis and want to remain as part of mainstream society (Ittefaq et al., 2023). Waste-packers were treated unfairly as unclean, uneducated entities in society exacerbated the term identity crisis among waste-pickers, despite their crucial contribution to environmental sustainability. Additionally, depression and anxiety were the silent weapons among waste-pickers, because they frequently report sadness, apathetic toward work, and lack

of energy. A quotation from a study was “why are you asking about tension? There is tension everyday” (Kisana & Shah, 2021). However, psychological issues of waste-pickers were not widely recognized in academic and policy arena. A study analogously revealed that psychological suffering was one of the least exercised and practiced issues in South Asian countries (Sara et al., 2022).

Social relationships, interactions and living environments have a great impact on quality of life. This study found waste-pickers social relationship score was higher than any other category, while the lower score for living environment. In terms of social relationships, especially personal relationships with friends, families and neighbours toward waste-pickers were highly positive. They got all kinds of social support from their neighbours and could easily participate in social, cultural and religious festivals. This finding is contradictory with the result of another study which reported that waste-pickers were neglected in public places such as temples and religious festivals (Raghavendra & Kumar, 2022). But regarding the category of people’s attitudes, this study found fully negative relationship such as they were treated as neglected, undervalued, marginalized and lower classes. In 2019, the World Bank reported that waste-pickers were often ignored, undervalued, and marginalized in society. During the collection of waste from households, more than 80% of people showed negative attitudes toward waste-pickers. When people see waste-pickers in streets along with their heavily loaded vans, people changed their roadsides. Previous study reported that the community which was engaged with waste and sanitation works is called Dalit, belong to the lower tier of the man-made hierarchy, often referred as untouchable (Kakar et al., 2022). Additionally, this study found hereditary relationships regarding the profession of waste picking such as fathers transferring their duties to their children. In the same way, waste managing activities were distributed based on caste in some countries in Asia like India (Kakar et al., 2022). Moreover, this study revealed that some waste-pickers from other districts did not let their family to know about their profession. On the other hand, the conditions of the location of their living area were very poor. Lack of pure drinking water, unhealthy sanitation, little and congested living room were common among the living area of waste-pickers. One of the previous studies found that most of the waste-pickers lived in the slums where they had no proper sanitation and drinking water facilities, the birthplace of several infectious diseases (Paul & Bhattacharjee, 2022).

5. Conclusion

Major contribution of this study can be categorized into present status of waste management practices, quality of life of waste-pickers, effects of some management related variables on the quality of life of waste-pickers and some recommendations regarding the major findings. This study consolidated mixed approach (explanatory sequential) for ensuring data triangulation, with thematic analysis which ensured the methodological, philosophical foundation to understand and analysis waste management practices and its effects on quality of life of waste-pickers. Therefore, this study added some concrete findings about the research area. Firstly, this study provides a comprehensive perspective about waste management practices in the SCC. Solid Waste Management Rules 2021 it was followed as a foundation of this study that helped to cover pros and cons of waste management practices. Secondly, this study assessed quality of life of waste-pickers by using WHOQOL-BREF questionnaire, which is widely

recognized for their reliability and validity. The results from these assessments tools scored 37 units on a scale of 100, which indicates that quality of life of waste-pickers in Sylhet City Corporation is poor. Thirdly, this study tried to find whether waste management practices have any effects on quality of life of waste-pickers and found around 25% variability of quality of life due to waste management practices.

Finally, the study recommends the following way outs to overcome the challenges thereof and improve the waste management practices along with the quality of life of the waste-pickers as well:

1. For ensuring primary recycling in the sources, three bin initiative is the most effective way. This program should be restarted. City authorities should replace existing vans and compactor truck into three-fold. This process can be started from 2–3 words primarily and gradually spread over the whole city. Similarly, composting waste can be collected twice a week, whereas hazardous and plastics materials can be collected once a week through managing extra trips. These strategies will ensure the proper utilization of existing transportation facilities.
2. Local community organizations played an important role in waste management practices at the primary stage. They recruited workers, managed salaries from households for waste pickers. There is a significant difference between muster roll and non-muster roll workers regarding salary, allowance and working equipment. In this case, for immediate solution, waste management department should co-operate with local community organizations to make all of them as muster roll waste- pickers, as if both muster and non- muster roll workers get equal salary and other benefits. In the long run, waste-pickers should give the status of government officials, which will be the reward of professional recognition.
3. The city corporation should build 42 secondary transfer stations and appoint supervisors to cover the whole area and make sure that bleaching powder is sprayed properly
4. Adequate budgeting is one of the major obstructions for proper waste management. However, private sector involvement in the recycling process will be the best way.
5. Safety equipment such as gum boots, face mask, and gloves should be provided to both muster roll and non-muster workers and arranged formal training sessions to make sure workers can properly use the safety equipment and avoid accidents in the workplace.
6. This study found both the muster roll and non-muster roll waste-pickers got salary around TK 10000–12000 per month. This amount should be increased to TK 20000 considering the living cost and all of them should be included in the Universal Pension scheme.
7. This study revealed there was an absence of middle management which is why the waste department cannot co-operate with other stakeholders. Sufficient and efficient manpower should be appointed in the waste department.
8. Insurance for physical health hazards, routine checkups, counselling for psychological well-being, and people’s attitudes should be changed toward waste- pickers.
9. Building public awareness to obey the rules and regulations is the most important part of effective waste management practices. Public discussion and online advertisement can be effective

Declarations

Authors Contribution

Mohammad Nashir Uddin- Study design, Facilitating study from conduct to completion, Critical review and editing

Md. Sofiulla Molla- Conceptualization, Study design, Data Collection, Data Analysis and Manuscript preparation

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Consent to Participate

Informed consent was obtained from all individual participants included in this study. Participants were informed about the purpose of the research, and their participation was voluntary.

Ethics Approval

This study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was taken from Thesis Supervisory Committee, Department of Public Administration, Shahjalal University of Science and Technology, Sylhet, Bangladesh.

Competing Interest

- The authors have no relevant financial or non-financial interests to disclose.
- The authors have no conflicts of interest to declare that are relevant to the content of this article.

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Footnotes

1 The term quality of life refers to physical health condition, psychological wellbeing, social status and living environment of waste pickers in Sylhet City Corporation.

[2] $n = \frac{n_0}{1+(n_0-1)N} = 196$, where $n_0 = \frac{Z^2\,p(1-p)}{e^2}$ = sample size (for unknown population), n = sample size (known population, Z score = 1.96 @ p (population proportion) = 50% = 0.5 and e (margin of error) = 0.05, confidence level = 95%.