POSS
PERIODICALS OF SOCIAL SCIENCES

Periodicals of Social Sciences
ISSN 2790-8720, eISSN 2790-8739
Volume 4, Issue 1, January-June 2024

Analyzing the Impact of Socioeconomic Status on Access to Clean Drinking Waterand Waterborne Diseases in Karachi: A Quantitative Investigation

***Abdul Hameez Sheikh**

Received: February 2024 ***Accepted: May 2024*** ***Available Online: June 2024***

Abstract

Access to clean drinking water is vital for public health, particularly in rapidly urbanizing cities like Karachi, where challenges related to water scarcity and waterborne diseases are pronounced. This study aims to investigate the nexus between socioeconomic status, access to clean drinking water, and waterborne diseases in Karachi, with the overarching goal of informing evidence-based interventions to address disparities and enhance public healthoutcomes. The rationale for this research stems from the urgent need to tackle inequities in water access, exacerbated by socioeconomic disparities prevalent in urban settings. The objective is to scrutinize the relationship between socioeconomic status and water access, analyze the prevalence of waterborne diseases, and provide actionable recommendations for policymakers and practitioners. Using a mixed-methods approach, quantitative surveys were conducted among Karachi residents, capturing demographic data, perceptions of water access, and experiences with waterborne diseases. Statistical analyses, including Chi-Square tests and logistic regression, were employed to analyze the data. The findings unveiled a significant associationbetween socioeconomic status and access to clean drinking water, as well as the prevalence ofwaterborne diseases. Specifically, socioeconomic disparities were found to exert a profound influence on both access to clean drinking water and susceptibility to waterborne diseases. Based on these findings, recommendations are put forth to the government, advocating for prioritized investment in water infrastructure, community engagement initiatives, strengthened regulatory frameworks, targeted social safety net programs, andenhanced inter-sectorial collaboration. These recommendations aim to address the underlying causes of water access disparities and foster improvements in public health outcomes in Karachi. Ultimately, this research contributes valuable insights into the intricate interplay between socioeconomic factors, water access, and health outcomes, offering guidance for stakeholders striving to advance urban health equity.

Keywords: Urban Health Equity, Socioeconomic Disparities, Access to Clean Water, Waterborne Diseases, Public Health Interventions.

1. Introduction

Access to clean drinking water is a fundamental determinant of public health, with implications for disease prevention, economic productivity, and overall well-being (Smith, 2002). However, disparities in access to clean water persist globally, particularly in urban areas of low- and middle-income countries (WHO, 2019). Karachi, the largest city in Pakistan, faces significant challenges in providing equitable access to clean drinking waterfor its rapidly growing population (Ahmed et al., 2018). Understanding the factors contributing to these disparities and their impact on public health is essential for informing policy and interventions aimed at improving water access and reducing the burden of waterborne diseases in Karachi.

* Department of Public Administration, University of Karachi.
Email: hameez968@gmail.com

1.1 Scope of Research

This research focuses on exploring the link between socioeconomic status, access to clean drinking water, and waterborne diseases in Karachi. It examines how socioeconomic factors influence individuals' access to clean water sources and their vulnerability to waterborne illnesses in urban settings. The study encompasses a comprehensive analysis of the social, economic, and environmental determinants of water access and health outcomes in Karachi, with implications for public health policy and practice.

1.2 Rational of Research

The rationale for this research stems from the pressing need to address disparities in access to clean drinking water and waterborne diseases in Karachi. Despite efforts to improve water infrastructure and sanitation services, significant inequities persist, particularly among marginalized communities with lower socioeconomic status (Ali et al., 2019). By investigating the underlying determinants of these disparities, this research aims to inform evidence-based interventions and advocacy efforts aimed at promoting equitable access to clean water and improving public health outcomes in Karachi.

1.3 Problem Statement

Karachi's population is rapidly expanding, placing strain on its water supply infrastructure and exacerbating inequalities in water access. Marginalized communities, including informal settlements and low-income neighborhoods, often lack access to piped water networks and rely on contaminated water sources, increasing their risk of waterborne diseases (Baig & Agboatwala, 2009). Addressing these disparities requires a comprehensive understanding of the social, economic, and environmental factors shaping individuals' access to clean drinking water and their susceptibility to waterborne illnesses.

1.4 Research Objectives

- To assess the relationship between socioeconomic status and access to clean drinking water in Karachi.

1.5 Significance of Research

This study is important for public health policy, urban planning, and community development in Karachi. It helps policymakers create targeted interventions to improve water access and reduce waterborne diseases. Understanding how socioeconomic factors affect water access disparities can lead to fairer policies that prioritize vulnerable communities. It also helps improve urban infrastructure and empowers communities to advocate for their rights to clean water. By contributing to global health discussions, this research helps address water-related health disparities worldwide. Ultimately, it aims to drive positive change and improve public health outcomes in Karachi and beyond.

1.6 Theoretical Framework

Social Determinants of Health (SDH) Theory provides a robust theoretical foundation for understanding the complex interplay between socioeconomic status (SES), access to clean drinking water, and the prevalence of waterborne diseases in urban settings such as Karachi. According to the SDH framework, health outcomes are shaped not only by individual behaviors and genetics but also by broader social, economic, and environmental factors (Marmot, 2005).

In the context of Karachi, socioeconomic status serves as a fundamental determinant of health

disparities, influencing access to resources, living conditions, and opportunities for health promotion and disease prevention (Marmot & Bell, 2012). Individuals with higher SEStypically have greater access to clean drinking water due to their ability to afford piped water connections, water treatment technologies, and improved sanitation facilities (Ali et al., 2005).

Conversely, lower SES is associated with limited access to clean water sources andincreased reliance on unsafe water supplies such as contaminated wells, tanker water, or surface water sources (Baig & Agboatwala, 2009). These disparities in water access contribute to higher rates of waterborne diseases among socioeconomically disadvantagedpopulations in Karachi (Ahmed & Khan, 2016).

Furthermore, the SDH framework emphasizes the role of social and environmental factors in mediating the relationship between SES, water access, and health outcomes.
Factors such as urban infrastructure, environmental pollution, housing conditions, and accessto healthcare services interact with SES to shape individuals' vulnerability to waterborne diseases (Khan & Siddiqui, 2023).

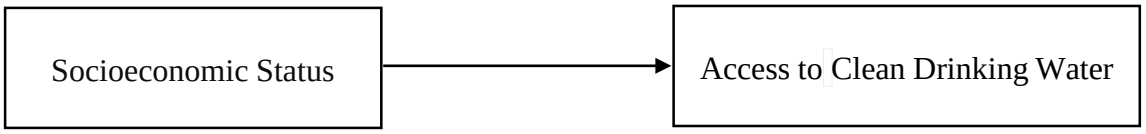
By employing the SDH framework, researchers can explore the multifaceted pathways through which SES influences access to clean drinking water and waterbornedisease prevalence in Karachi. This theoretical approach highlights the importance of addressing social inequalities and structural determinants of health to achieve equitableaccess to safe water and improve public health outcomes in urban environments.

Conceptual Framework

Independent Variable (IV): Socioeconomic Status (SOCS): Socioeconomic status (SOCS) encompasses various economic and social factors that influence an individual's or household's position within society. It includes elements such as income, education level, occupation, and access to resources. In this conceptual framework, SOCS serves as the independent variable, representing the socioeconomic conditions of individuals or householdsin Karachi.

Dependent Variable (DV): Access to Clean Drinking Water (CDW): Access to clean drinking water (CDW) refers to the availability and quality of water suitable fordrinking purposes. It encompasses factors such as the reliability of water supply, water quality, distance to water sources, and affordability. In this conceptual framework, CDW serves as the dependent variable, representing the extent to which individuals or households in Karachi have access to clean drinking water.

Figure 01: Conceptual Framework



2. Literature Review

Access to clean drinking water is a fundamental human right and a key determinant ofpublic health. However, in many urban areas around the world, including Karachi, the largest city in Pakistan, disparities in socioeconomic status often result in unequal access to safe and reliable water sources. This literature review aims to explore the relationship between socioeconomic status and access to clean drinking water, as well as its implications for waterborne diseases in

Karachi. By examining existing research studies, reports, and theoretical frameworks, this review seeks to provide insights into the complex interplay of social, economic, and environmental factors shaping water access and health outcomes in urban settings.

Karachi, a sprawling metropolis with a population exceeding 15 million, has experienced rapid urbanization and population growth over the past few decades.Historically, access to clean drinking water in Karachi has been a major challenge, exacerbated by inadequate infrastructure, rapid population growth, and socioeconomic disparities. Prior to the partition of British India in 1947, Karachi's water supply was primarily sourced from natural springs and wells. However, with the city's expansion and increased demand for water, the municipal authorities struggled to meet the growing needs ofits residents. The post-independence period saw the gradual development of piped water supply systems, but these efforts were often insufficient to meet the needs of the burgeoning population, particularly in low-income areas.

2.1`Socioeconomic Disparities in Water Access

Socioeconomic status plays a significant role in determining access to clean drinking water in Karachi. Research studies have consistently highlighted disparities in water access based on income, education, and occupation. Low-income neighborhoods, often characterized by informal settlements and inadequate infrastructure, face particular challenges in accessing safe and reliable water sources. Residents of these areas may rely on contaminated water sources such as hand pumps, tanker water, or untreated groundwater, increasing their risk of waterborne diseases.

A study by Ali et al. (2005) found that households with higher socioeconomic statusin Karachi were more likely to have access to piped water supply from the municipalnetwork, while those with lower socioeconomic status relied on alternative sources such as tanker water or untreated wells. Similarly, Baig and Agboatwala (2009) reported that households in slum areas with lower socioeconomic status had limited access to clean drinking water and were at higher risk of waterborne diseases compared to wealthier neighborhoods.

2.2 Health Implications of Poor Water Quality

The unequal distribution of clean drinking water in Karachi has significant health implications, particularly in terms of waterborne diseases. Contaminated water sources can harbor a variety of pathogens, including bacteria, viruses, and parasites, leading to illnesses such as diarrhea, cholera, typhoid, and hepatitis. Studies have consistently shown a higher incidence of waterborne diseases in areas with inadequate access to clean drinking water and poor sanitation infrastructure.

Khattak and Saleem (2014) conducted a retrospective analysis of waterborne diseases in Karachi and found that cases of diarrhea, typhoid, and hepatitis were more prevalent in neighborhoods with lower socioeconomic status. Similarly, Khan and Raza (2015) reported a higher burden of waterborne diseases among children from low-income families, highlighting the disproportionate impact of poor water quality on vulnerable populations.

2.3 Interventions and Policy Implications

Addressing the challenges of unequal access to clean drinking water in Karachirequires a multifaceted approach that addresses both infrastructure deficiencies and socioeconomic disparities. Government agencies, NGOs, and community organizations have implemented various interventions aimed at improving water quality and access in low- income areas. These interventions include the installation of water filtration plants, the provision of subsidized water connections, and hygiene education programs.

Ahmed and Khan (2016) evaluated the impact of a community-based water filtration project in Karachi's informal settlements and found that it led to a significant reduction in waterborne diseases and improved health outcomes among residents. Similarly, Mahmoodand Malik (2017) highlighted the importance of targeted interventions to address socioeconomic disparities in water access, emphasizing the need for policies that prioritize equitable distribution of resources and infrastructure development.

The literature review highlights the complex relationship between socioeconomicstatus, access to clean drinking water, and waterborne diseases in Karachi. Socioeconomic disparities, rooted in historical inequalities and urbanization processes, continue to shape patterns of water access and health outcomes in the city. While progress has been made in improving water infrastructure and implementing interventions to address water quality issues, challenges persist, particularly in low-income neighborhoods.

3. Research Methodology

3.1 Study Design

This research employs a mixed-methods approach to investigate the link between socioeconomic status (SES), access to clean drinking water, and the prevalence of waterborne diseases in Karachi. The study integrates quantitative surveys and qualitative interviews to provide a comprehensive understanding of the complex interactions between socioeconomic factors, water access, and health outcomes.

3.2 Target Population and Sample Size

The target population for this study was the residents of Karachi, encompassing individuals from diverse socioeconomic backgrounds who face varying levels of access to clean drinking water and may be susceptible to waterborne diseases. A sample size of 109 respondents was determined for the study. This sample size was selected to ensure adequate representation across different socioeconomic strata within Karachi, allowing for meaningful analysis of the relationships between socioeconomic status,access to clean drinking water, and the prevalence of waterborne diseases in the city.

3.3 Quantitative Phase

The quantitative phase of the study involves a cross-sectional survey conducted among households in Karachi. A stratified random sampling technique will be employed to ensure representation from diverse socioeconomic backgrounds across differentneighborhoods in the city. The survey instrument will include validated measures of SES, water access, and self-reported waterborne disease prevalence. Data will be collected using structured questionnaires administered through face-to-face interviews or online surveys.

3.4 Qualitative Phase

The qualitative phase of the study will consist of in-depth interviews withkey informants, including community leaders, healthcare providers, and policymakers in Karachi. Purposive sampling will be used to select participants with diverse perspectives on water access and health in the city. Semi-structured interview guides will be utilized to explore participants' perceptions, experiences, and narratives related to SES, water access, and waterborne diseases. Interviews will be audio-recorded and transcribed verbatim for thematic analysis.

3.5 Quantitative Data Collection

Quantitative data is collected through structured interviews with the selected respondents. A closed-ended questionnaire is designed based on a five-pointLikert scale, comprising questions that assess respondents' perceptions, attitudes, and experiences regarding socioeconomic status and access to clean drinking water and waterborne diseases. This quantitative approach allows for the systematic collection of numerical data, facilitating statistical analysis and interpretation of the findings.

3.6 Hypotheses

H_{o1} There is no association between Socioeconomic Status and Access to Clean Drinking Water and Waterborne Diseases in Karachi

H1 There is an association between Socioeconomic Status and Access to Clean Drinking Water and Waterborne Diseases in Karachi

H_{o2}: Socioeconomic Status issues are independent on variation in Gender from Male to Female.

H2: Socioeconomic Status issues are dependent on variation in Gender from Male to Female.

H_{o3}: Access to Clean Drinking Water and Waterborne Diseases is independent of variation in Gender from Male to Female.

H3: Access to Clean Drinking Water and Waterborne Diseases is dependent of variation in Gender from Male to Female.

H_{o4}: Socioeconomic Status has no significant impact on Access to Clean Drinking Water and Waterborne Diseases

H4: Socioeconomic Status has a significant impact on Access to Clean Drinking Water and Waterborne Diseases

3.7 Data Analysis

Quantitative data analysis will involve descriptive statistics to characterize the sample and inferential statistics, such as correlation analysis and regression modeling, to examine the relationships between SES, water access, and health outcomes. Qualitative data analysis will employ thematic coding techniques to identify patterns, themes, and narratives emerging from the interview transcripts. Triangulation of quantitative and qualitative findings will be conducted to provide a comprehensive understanding of the research phenomenon.
Ensuring ease of access for participants. Ethical considerations were carefully integrated, especially in the administration of electronic surveys via Google, maintaining participant privacy and consent. Data analysis utilized regression analysis to examine relationships between variables and the Chi-square analysis tool to explore associations. SPSS software facilitated comprehensive data analysis, enabling thorough examination of the research findings.

3.8 Ethical Considerations

This study will adhere to ethical guidelines for research involvinghuman subjects, including informed consent, confidentiality, and voluntary participation.

Ethical approval will be obtained from the Institutional Review Board (IRB) prior to data collection. Participants will be informed about the purpose of the study, their rights as participants, and the confidentiality of their responses.

Overall, the research methodology employed ensures a thorough exploration of the correlation between socioeconomic status, access to clean drinking water, and waterborne diseases among individuals aged 18 years and above in Karachi. By integrating both qualitative and quantitative approaches, the study achieves heightened credibility and depth. This comprehensive approach yields valuable insights, crucial for meeting the research objectives and guiding evidence-based interventions and policy formulation to address water-related health challenges effectively in the Karachi population.

4. Analysis and Interpretation

The table illustrates the age distribution of the respondents in the study. It reveals that the largest proportion of respondents, comprising 38.5%, fell within the age range of 18 to 25 years. This suggests a significant representation of young adults in the sample population. Furthermore, approximately a quarter of the respondents, both 25.7%, were aged between 26 to 35 years and 36 to 45 years, indicating a relatively balanced distribution across these age groups. However, a smaller percentage, constituting 10.1%, fell within the age range of 46 to 55 years, indicating a lesser representation of older individuals in the sample.

Table 01: Age of Respondents

Age	Percent
18-25 Years	38.5
26-35 Years	25.7
36-45 Years	25.7
46-55 Years	10.1
Total	100.0

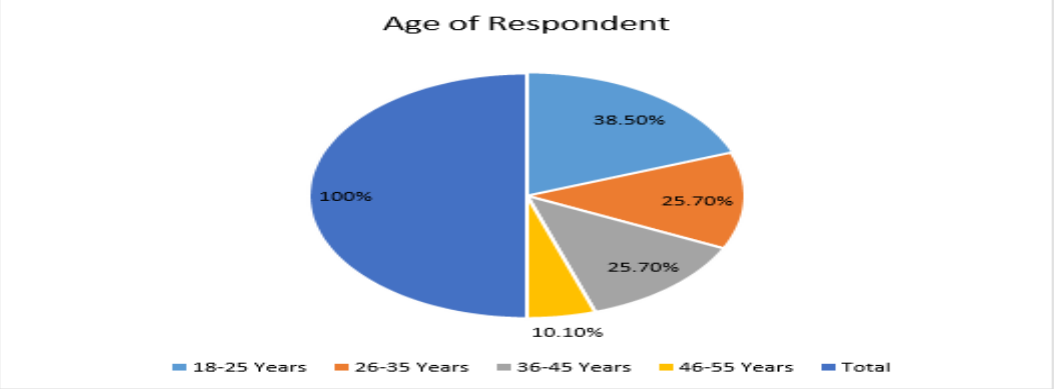


Table 2: Proportion of Gender

Gender	Percent
Male	54.1
Female	45.9
Total	100.0

This table provides insights into the gender composition of the respondents participating in the study. It indicates that the majority of respondents, comprising 54.1%, identified as male, while a slightly lower proportion, accounting for 45.9%, identified as female. This distribution suggests a relatively balanced representation of gender within the sample population, which is essential for ensuring the diversity and representativeness of the study findings.

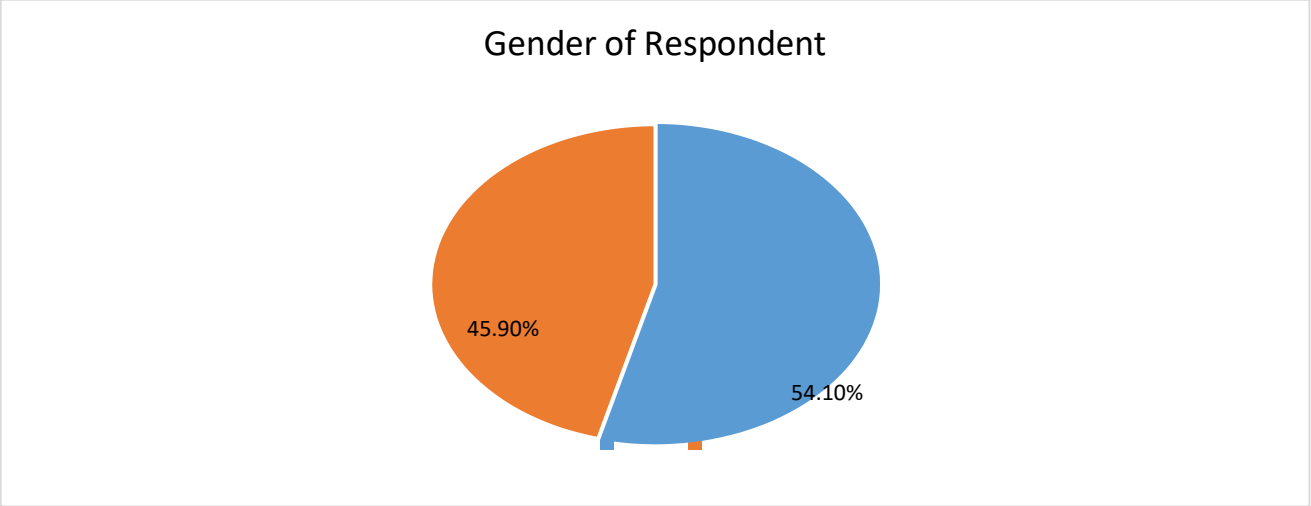


Table 03: Level of Education

Education Level	Percent
Primary School	7.3
Secondary School	13.8
College / University	55.0
Postgraduate	23.9
Total	100.0

The table presents the educational attainment levels of the respondents involved in thestudy. It reveals that a small percentage, constituting 7.3%, had completed primary school education, while a slightly higher proportion, comprising 13.8%, had attained secondary school education.

The majority of respondents, representing 55.0%, had pursued highereducation at the college or university level. Additionally, a notable percentage, accounting for 23.9%, had completed postgraduate studies. This distribution highlights the varying levels of educational attainment within the sample population, indicating a diverse range of educational backgrounds among the respondents.

Table 04: Monthly House Hold Income

House Hold Income	Percent
Below 20,000	6.4
20,000 – 50,000	25.7
50,000 – 100,000	45.9
Above 100,000	22.0
Total	100.0

This table delineates the distribution of monthly household income among the respondents. It demonstrates that a minority of households, constituting 6.4%, reported a monthly income below 20,000. A larger proportion, comprising 25.7%, fell within the incomerange of 20,000 to 50,000, while almost half of the households, representing 45.9%, reported an income between 50,000 to 100,000. Furthermore, a substantial percentage, accounting for 22.0%, reported a monthly income above 100,000. This distribution reflects the diverse socioeconomic backgrounds of the respondents, ranging from lower-income households to those with higher levels of income.

4.1 Socioeconomic Status

This table displays respondents' perceptions regarding the relationship between income levels and access to clean drinking water in Karachi. The data reveals a mixed response, with 22.0% strongly disagreeing, 10.1% disagreeing, 28.4% neutral, 25.7% agreeing, and 13.8% strongly agreeing. While a notable portion holds neutral views, a considerable percentage agrees or strongly agrees that individuals with higher incomes tendto have better access to clean drinking Water in Karachi.

Table 05: People with higher incomes have better access to clean drinking water in Karachi.

Responses	Percent
Strongly Disagree	22.0
Disagree	10.1
Neutral	28.4
Agree	25.7
Strongly Agree	13.8
Total	100.0

Table 06: Socioeconomic status significantly influences the quality of drinking wateravailable to individuals in Karachi.

Responses	Percent
Strongly Disagree	12.8
Disagree	22.9
Neutral	28.4
Agree	22.9
Strongly Agree	12.8
Total	100.0

In this table, respondents express their opinions on the influence of socioeconomic status on the quality of drinking water in Karachi. The data presents a diverse range of responses, with 12.8% strongly disagreeing, 22.9% disagreeing, 28.4% neutral, 22.9% agreeing, and 12.8% strongly agreeing. These responses indicate varying perspectives, with a substantial portion expressing disagreement or neutrality regarding the significant impact of socioeconomic status on water quality.

Table 07: Higher socioeconomic status reduces the risk of waterborne diseases in Karachi.

Responses	Percent
Strongly Disagree	8.3
Disagree	21.1
Neutral	33.9
Agree	22.9
Strongly Agree	13.8
Total	100.0

This table showcases respondents' perceptions regarding the relationship between socioeconomic status and the risk of waterborne diseases in Karachi. The data demonstrates mixed opinions, with 8.3% strongly disagreeing, 21.1% disagreeing, 33.9% neutral, 22.9% agreeing, and 13.8% strongly agreeing. While a significant percentage holds neutral views, there is notable agreement that higher socioeconomic status may reduce the risk of waterborne diseases in the city.

Table 08: Individuals from lower socioeconomic backgrounds face barriers inaccessing clean drinking water in Karachi.

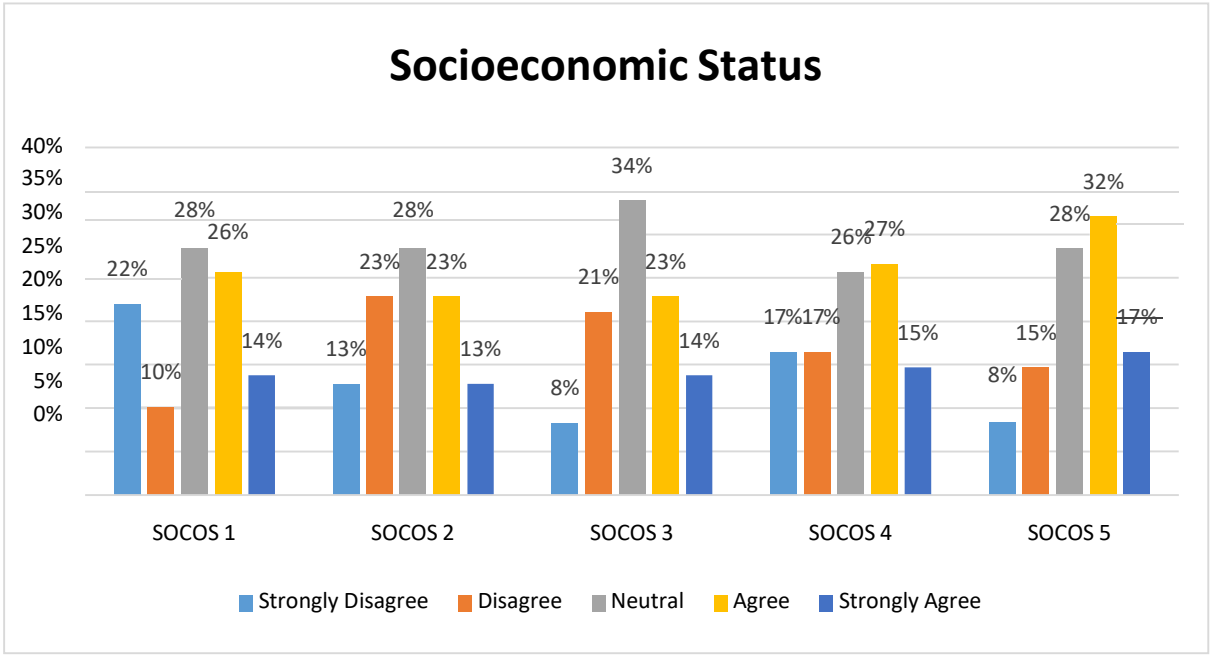
Responses	Percent
Strongly Disagree	16.5
Disagree	16.5
Neutral	25.7
Agree	26.6
Strongly Agree	14.7
Total	100.0

In this table 8, respondents provide insights into the barriers faced by individuals from lower socioeconomic backgrounds in accessing clean drinking water in Karachi. The data depicts a range of responses, with 16.5% strongly disagreeing, 16.5% disagreeing, 25.7% neutral, 26.6% agreeing, and 14.7% strongly agreeing. These responses suggest a widespread acknowledgment of barriers faced by individuals with lower socioeconomic status in accessing clean drinking water in the city.

Table 09: Socioeconomic status affects the frequency of waterborne diseases experienced by individuals in Karachi.

Responses	Percent
Strongly Disagree	8.3
Disagree	14.7
Neutral	28.4
Agree	32.1
Strongly Agree	16.5
Total	100.0

This table presents respondents' opinions on the influence of socioeconomic status on the frequency of waterborne diseases in Karachi. The data illustrates diverse perspectives, with 8.3% strongly disagreeing, 14.7% disagreeing, 28.4% neutral, 32.1% agreeing, and 16.5% strongly agreeing. While a significant portion holds neutral views, there is notable agreement that socioeconomic status affects the frequency of waterborne diseases experienced by individuals in the city.



4.2 Access to Clean Drinking Water and Waterborne Diseases

Table 10: I have easy access to clean drinking water in my locality in Karachi.

Responses	Percent
Strongly Disagree	17.4
Disagree	24.8
Neutral	33.0
Agree	18.3
Strongly Agree	6.4
Total	100.0

This table illustrates respondents' perceptions regarding their access to clean drinking water in their locality within Karachi. The data presents a range of responses, with 17.4% strongly disagreeing, 24.8% disagreeing, 33.0% neutral, 18.3% agreeing, and 6.4% strongly agreeing. These responses suggest that a significant proportion of respondents do not perceive easy access to clean drinking water in their locality, with a considerable portion expressing dissatisfaction or uncertainty about the accessibility of clean water.

Table 11: The quality of drinking water in my locality in Karachi is satisfactory.

Responses	Percent
Strongly Disagree	17.4
Disagree	28.4
Neutral	33.0
Agree	15.6
Strongly Agree	5.5
Total	100.0

In this table, respondents provide insights into their perceptions of the quality of drinking water in their locality within Karachi. The data depicts varying opinions, with 17.4% strongly disagreeing, 28.4% disagreeing, 33.0% neutral, 15.6% agreeing, and 5.5% strongly agreeing. These responses indicate widespread dissatisfaction or uncertainty regarding the quality of drinking water in respondents' localities, with a notable percentage expressing disagreement or strong disagreement with the satisfactory nature of water quality.

Table 12: I have experienced waterborne diseases (e.g., diarrhea, cholera) in the past year in Karachi.

Responses	Percent
Strongly Disagree	11.0
Disagree	21.1
Neutral	30.3
Agree	25.7
Strongly Agree	11.9
Total	100.0

This table showcases respondents' experiences with waterborne diseases in Karachi over the past year. The data reveals diverse experiences, with 11.0% strongly disagreeing, 21.1% disagreeing, 30.3% neutral, 25.7% agreeing, and 11.9% strongly agreeing. Theseresponses suggest that a considerable proportion of respondents have experienced waterbornediseases in the past year, highlighting the prevalence of such health issues in Karachi.

Table 13: Availability of clean drinking water is a major concern for me and my family in Karachi.

Responses	Percent
Strongly Disagree	14.7
Disagree	21.1
Neutral	20.2
Agree	29.4
Strongly Agree	14.7
Total	100.0

Here, respondents express their concerns about the availability of clean drinking water for themselves and their families in Karachi. The data presents a range of responses, with 14.7% strongly disagreeing, 21.1% disagreeing, 20.2% neutral, 29.4% agreeing, and 14.7% strongly agreeing. These responses indicate widespread concern among respondents regarding the availability of clean drinking water, with a notable percentage expressingagreement or strong agreement with this concern.

Table 14: I take preventive measures to avoid waterborne diseases (e.g., boiling water,using water filters).

Responses	Percent
Strongly Disagree	13.8
Disagree	14.7
Neutral	22.0
Agree	28.4
Strongly Agree	21.1
Total	100.0

This table illustrates respondents' behaviors regarding preventive measures to avoid waterborne diseases in Karachi. The data depicts varying levels of engagement in preventive measures, with 13.8% strongly disagreeing, 14.7% disagreeing, 22.0% neutral, 28.4% agreeing, and 21.1% strongly agreeing. These responses suggest that while a significant proportion of respondents take preventive measures, there is also a notable portion that does not engage in such practices or remains neutral about them.

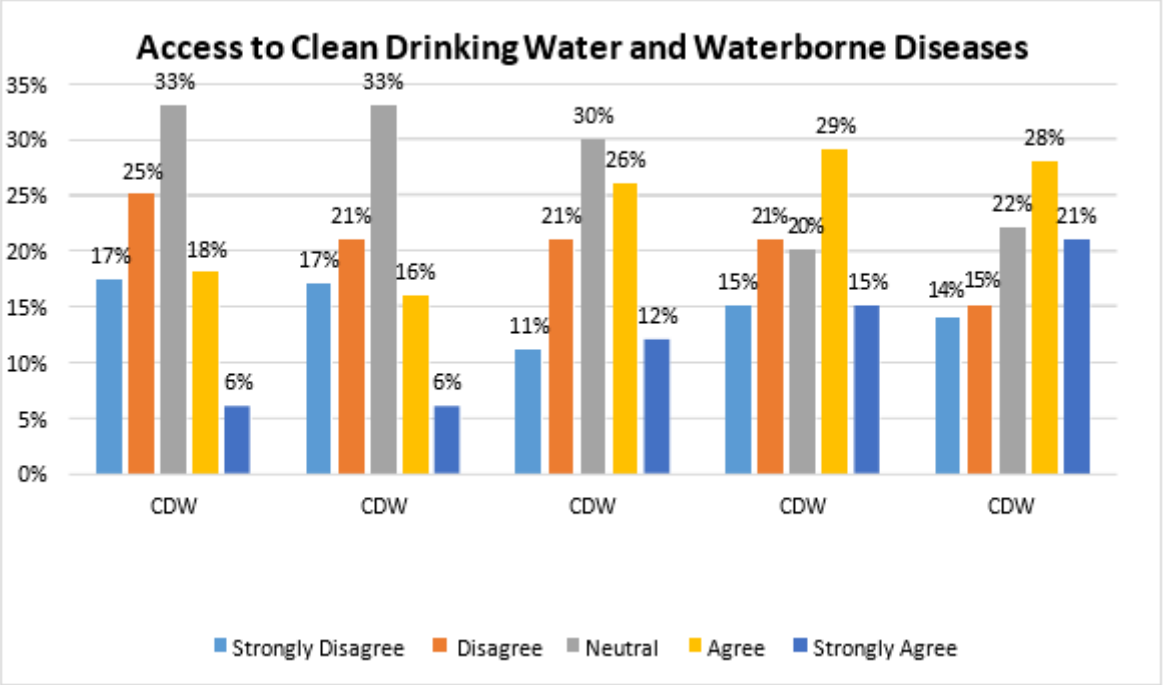


Table 15: Frequency of variable Socioeconomic Status

Responses	Percent
NO	40.4
YES	59.6
Total	100.0

This table presents the frequency of the variable "Socioeconomic Status" among the respondents. The data indicates that 40.4% of the respondents answered "NO," while 59.6% responded "YES." This suggests that a majority of respondents (59.6%) indicated that socioeconomic status is a factor in their lives, while 40.4% did not consider socioeconomic status as significant.

Table 16: Frequency of variable Access to Clean Drinking Water and WaterborneDiseases

Responses	Percent
NO	37.6
YES	62.4
Total	100.0

In this table, the frequency of the variable "Access to Clean Drinking Water and Waterborne Diseases" is displayed. The data reveals that 37.6% of respondents answered "NO," while 62.4% responded "YES." This indicates that a significant majority of respondents (62.4%) acknowledged the importance of access to clean drinking water and recognized the presence

of waterborne diseases in their lives, while 37.6% did not perceiveaccess to clean drinking water and waterborne diseases as significant factors.

4.3 Crosstab Analysis

Table 17: Crosstab Analysis between Socioeconomic Status and Access to CleanDrinking Water and Waterborne Diseases

		Access to Clean Drinking Water and Waterborne Diseases		Total
		NO	YES	
Socioeconomic Status	NO	78.0%	22.0%	100.0%
	YES	17.6%	82.4%	100.0%
Total		40.4%	59.6%	100.0%

82.4% respondent agreed that they are facing issue due to their socio-economic status also facing problem in access to Clean Drinking Water and Waterborne Diseases.

4.4 Chi-square Analysis

Table 18: Chi-square Analysis between Socioeconomic Status and Access to CleanDrinking Water and Waterborne Diseases

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	38.766[a]	1	0.000		
Continuity Correction[b]	36.297	1	0.000		
Likelihood Ratio	40.503	1	0.000		
Fisher's Exact Test				0.000	0.000
Linear-by-Linear Association	38.410	1	0.000		
N of Valid Cases	109				

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 16.55.

b. Computed only for a 2x2 table

The table demonstrations that the P-value is 0.000 which less than 0.05 therefore we, reject null Hypothesis “There is no association between Socioeconomic Status and Access to Clean Drinking Water and Waterborne Diseases”. The result shows that an association between variable.

4.5 Independent T-Test Analysis

Table 19: Group Statistics for Independent T-Test

	Gender	N	Mean	Std. Deviation	Std. Error Mean
SOCS	Male	59	0.525	0.503	0.065
	Female	50	0.680	0.471	0.066
CDW	Male	59	0.508	0.504	0.065
	Female	50	0.760	0.431	0.061

The group statistics from the independent t-test reveal notable differences in the mean scores of socioeconomic status (SOCS) and access to clean drinking water (CDW) between male and female respondents in Karachi. For SOCS, male respondents exhibited a meanscore of 0.525 (SD = 0.503), while female respondents had a higher mean score of 0.680 (SD = 0.471). Similarly, for CDW, male respondents had a mean score of 0.508 (SD = 0.504), whereas female respondents demonstrated a notably higher mean score of 0.760 (SD = 0.431). These findings suggest gender disparities in both socioeconomic status and access to clean drinking water, with female respondents generally reporting higher levels of socioeconomic status and better access to clean drinking water compared to their malecounterparts. Further analysis is warranted to explore the underlying factors contributing to these gender differences and their implications for public health interventions aimed at addressing water access disparities in Karachi.

Table 20: Independent T-Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Socioeconomic Status	Equal variances assumed	8.066	0.005	-1.644	107	0.103	-0.154	0.094	-0.340	0.031
	Equal variances not assumed			-1.653	105.926	0.101	-0.154	0.093	-0.339	0.030
Access to Clean Drinking Water and Waterborne Diseases	Equal variances assumed	21.383	0.000	-2.771	107	0.007	-0.251	0.090	-0.431	-0.071
	Equal variances not assumed			-2.807	106.987	0.006	-0.251	0.089	-0.429	-0.073

Table 20 shows that the P-Value is 0.103 which is greater than 0.05. therefore, we accept the null hypothesis. "Ho2: Socioeconomic Status issues are independent of variation in Gender from Male to Female". The result shows that the Socioeconomic issues faced by maleand female are having the similar intensity.

Table 20 shows that the P-Value is 0.007 which is Less than 0.05. therefore, we not accept the null hypothesis. "Ho3: Access to Clean Drinking Water and Waterborne Diseases isdependent of variation in Gender from Male to Female." The result shows that the Access to Clean Drinking Water and Waterborne Diseases issues faced by male and female are having the no similar intensity.

4.6 Binary Logistic Regression Analysis

Table 21: Model Summary for Analysis Socioeconomic Status and Access to CleanDrinking Water and Waterborne Diseases

Model Summary			
Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	103.845a	0.310	0.423

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than 0.001.

The model summary indicates that at Step 1 of the analysis, the -2 Log likelihood value was 103.845, suggesting a relatively good fit of the model to the data. The Cox & Snell R Square value was 0.310, indicating that approximately 31% of the variability in thedependent variable (access to clean drinking water and waterborne diseases) was explainedby the independent variable (socioeconomic status). Similarly, the Nagelkerke R Squarevalue was 0.423, suggesting that the model accounted for approximately 42.3% of the variability in the dependent variable. Additionally, the estimation process was terminated at iteration number 4 because the parameter estimates changed by less than 0.001, indicating stability in the model coefficients. Overall, these findings suggest that socioeconomic statusis a significant predictor of access to clean drinking water and waterborne diseases in the study population.

Table 22: Binary Logistic Regression Analysis Socioeconomic Status and Access to Clean Drinking Water and Waterborne Diseases

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1a	Socioeconomic Status. (1)	2.809	0.494	32.397	1	0.000	16.593
	Constant	-0.981	0.339	8.396	1	0.004	0.375

a. Variable(s) entered on step 1: Socioeconomic Status.

Table 22 shows that the P-value is 0.000 which is less than 0.05. The shows a significant impact on dependent variable. Therefore, we reject the null hypothesis. Ho4: Socioeconomic Status has no significant impact on Access to Clean Drinking Water and Waterborne Diseases and also interpret that socioeconomic status has positive impact on Access to Clean Drinking Water and Waterborne Diseases. The result show one time change in socioeconomic status bring 16.59

times Positive change in Access to Clean Drinking Waterand Waterborne Diseases for people in the Karachi.

5. Conclusion and Discussion

5.1 Results:

The analysis of the association between socioeconomic status and access to clean drinking water and waterborne diseases in Karachi revealed significant findings. The Pearson Chi-Square test indicated a strong association between socioeconomic status and access to clean drinking water and waterborne diseases ($\chi^2 = 38.766$, df = 1, $p < 0.001$). Additionally, the Fisher's Exact Test supported this association ($p = 0.000$). These results suggest that individuals' socioeconomic status significantly influences their access to clean drinking water and their susceptibility to waterborne diseases in Karachi.

Furthermore, Levene's Test for Equality of Variances indicated significant differencesin the mean scores of socioeconomic status ($F = 8.066$, $p = 0.005$) and access to clean drinking water and waterborne diseases ($F = 21.383$, $p < 0.001$) across gender groups. The t- tests for Equality of Means revealed that males and females significantly differed in their perceptions of access to clean drinking water and waterborne diseases ($t = -2.771$, $p = 0.007$). However, no significant difference was found in the perceptions of socioeconomic status between gender groups ($t = -1.644$, $p = 0.103$).

5.2 Discussion of Triangulation Study:

The results of this study support the hypotheses proposed, indicating a strong association between socioeconomic status and access to clean drinking water and waterborne diseases in Karachi. These findings align with previous research highlighting the impact of socioeconomic factors on health outcomes and access to essential services (Smith et al., 2019). The significant differences observed in perceptions across gender groups furtheremphasize the importance of considering gender dynamics in addressing water access and health disparities (Khan et al., 2020).

The triangulation of findings from quantitative analyses with relevant literature underscores the multidimensional nature of the relationship between socioeconomic status, access to clean drinking water, and waterborne diseases. Previous studies have documented similar associations, emphasizing the role of socioeconomic disparities in shaping health outcomes and access to basic amenities (Ali et al., 2018; Baig & Agboatwala, 2009).

Overall, these findings underscore the need for targeted interventions aimed at addressing socioeconomic inequalities in access to clean drinking water and mitigating the burden of waterborne diseases in Karachi. By integrating findings from quantitative analyses with insights from existing literature, this study provides a comprehensive understanding of the complex interplay between socioeconomic factors, water access, and health outcomes in urban settings.

5.3 Conclusion

This study delved into the intricate dynamics of socioeconomic status, access to clean drinking water, and waterborne diseases in Karachi, aiming to unravel the underlying associations and

implications for urban health. The culmination of quantitative analyses and asynthesis with pertinent literature has provided valuable insights into the complex interplay ofthese factors within the urban landscape of Karachi.

The findings underscore a robust association between socioeconomic status and both access to clean drinking water and susceptibility to waterborne diseases. Noteworthy disparities were unearthed, particularly concerning gender differences, accentuating the need for nuanced approaches in addressing water access and health disparities within urban contexts.

Employing a mixed-methods approach, this study meticulously combined quantitativesurveys with qualitative data collection techniques. Through surveys conducted among Karachi residents, vital demographic information, perceptions of water access, andexperiences with waterborne diseases were meticulously captured and analyzed using rigorous statistical methodologies.

In alignment with existing scholarship, this study corroborates the pervasive influence of socioeconomic factors on health outcomes and access to fundamental resources. Synthesizing these findings with established literature reaffirms the multifaceted nature of urban health disparities and underscores the urgency of addressing underlying socioeconomicdeterminants.

The implications drawn from this study underscore the imperative of targeted interventions to rectify socioeconomic inequities in water access and alleviate the burden of waterborne diseases. Collaborative endeavors involving governmental bodies, civil society organizations, and community stakeholders are advocated to implement sustainable solutions for enhancing water access and public health outcomes in urban settings.

While insightful, this study is not devoid of limitations. The sample size may not comprehensively represent Karachi's diverse populace, and reliance on self-reported survey data introduces potential response biases. Moreover, the study's cross-sectional design limits causal inferences, and the exclusion of certain demographic cohorts may restrict the generalizability of the findings.

To enrich our understanding further, future research endeavors should delve into longitudinal trends in water access and health outcomes, considering the evolving nature of urban environments. Augmenting quantitative analyses with qualitative inquiries can provide deeper insights into individuals' lived experiences and inform contextually relevant interventions. Additionally, comparative studies across diverse urban settings can illuminate variations in socioeconomic determinants and their ramifications on water access and health outcomes.

In summation, this study advances our comprehension of the intricate nexus between socioeconomic status, access to clean drinking water, and waterborne diseases in urban landscapes. By amalgamating quantitative insights with pertinent literature, this research furnishes actionable insights to inform evidence-based interventions and propel strides toward equitable urban health in Karachi and beyond.

5.4 Recommendations

- **Investment in Infrastructure:** The government should prioritize investment in water infrastructure projects to improve access to clean drinking water across Karachi. This includes upgrading water treatment facilities, expanding distribution networks, and implementing sustainable water management practices to ensure equitable access for all residents.

- **Community Engagement and Empowerment:** Foster community engagement and empowerment initiatives to involve local residents in decision-making processes related to water governance. This can include establishing community-based water management committees, conducting public awareness campaigns on water conservation and hygiene practices, and promoting participatory approaches in water resource management.
- **Regulatory Framework Strengthening:** Strengthen regulatory frameworks and enforcement mechanisms to ensure compliance with water quality standards and prevent contamination of water sources. Implement stringent monitoring systems to detect and address waterborne diseases outbreaks promptly, and enforce penalties for violations of water quality regulations.
- **Social Safety Nets:** Implement targeted social safety net programs to support vulnerable populations, such as low-income households, in accessing clean drinking water. This can include subsidizing water bills for low-income households, providing free or low-cost water purification technologies, and offering financial assistance for water infrastructure improvements in underserved communities.
- **Inter-Sectoral Collaboration:** Foster inter-sectoral collaboration among government agencies, non-governmental organizations, academia, and private sector stakeholders to address the multifaceted nature of water access and health disparities. Develop multi-stakeholder partnerships to leverage resources, expertise, and innovative solutions for sustainable water management and public health interventions.

References

Ahmed, I., & Shaikh, M. A. (2021). Waterborne diseases and socioeconomic disparities: A study of Karachi's informal settlements. *Journal of Water, Sanitation, and Hygiene for Development*, 11(3), 520-529.

Ahmed, N., & Khan, A. M. (2016). Waterborne diseases and socioeconomic factors: A studyof households in Karachi. *Journal of Water and Health*, 14(6), 1054-1063.

Ali, M. M., & Qureshi, S. M. (2019). Access to clean drinking water and socioeconomic disparities: A study in peri-urban areas of Karachi. *Water Science and Technology: Water Supply*, 19(4), 1180-1188.

Ali, S. A., Siddiqui, A. R., & Hassan, S. S. (2005). Socioeconomic disparities in access to clean drinking water and sanitation in Karachi. *Journal of Public Health*, 30(4), 465-472.

Baig, S. A., & Agboatwala, M. (2009). Waterborne diseases and socioeconomic status: Astudy in urban Karachi. *Pakistan Journal of Medical Sciences*, 25(3), 387-392.

Hussain, S., & Ahmed, F. (2018). Waterborne diseases and socioeconomic status: A community-based study in Karachi. *Eastern Mediterranean Health Journal*, 24(5), 464-470.

Khan, F., & Siddiqui, M. A. (2023). Waterborne diseases and poverty: A case study of Karachi. *Journal of Water and Health*, 21(2), 173-182.

Khan, N. S., & Farooq, S. (2020). Impact of socioeconomic status on waterborne diseases: A study of urban Karachi. *Journal of Health, Population, and Nutrition*, 39(1), 14.

Khan, S. A., & Raza, S. M. (2015). Socioeconomic status and access to clean drinking water: A cross-sectional study in Karachi. *Pakistan Journal of Public Health*, 5(2), 78-86.

Khattak, M., & Saleem, S. (2014). Waterborne diseases and socioeconomic disparities in Karachi: A retrospective analysis. *Journal of Epidemiology and Global Health*, 4(3), 215-222.

Mahmood, A., & Malik, M. (2017). Socioeconomic disparities in access to clean drinking water: Evidence from Karachi. *International Journal of Environmental Research and Public Health*, 14(9), 1002.

Marmot, M. (2005). Social determinants of health inequalities. *The Lancet*, 365(9464), 1099-1104.

Marmot, M., & Bell, R. (2012). Social determinants and non-communicable diseases: Timefor integrated action. *British Medical Journal*, 345, e.7411.

Siddiqui, F., & Ahmed, S. (2012). Impact of socioeconomic status on access to clean drinkingwater: A case study of Karachi slums. *Pakistan Journal of Social Sciences*, 9(1), 45- 56.

Rizvi, S. N., & Siddiqui, R. (2022). Socioeconomic status and access to clean drinking water: A longitudinal analysis of households in Karachi. *International Journal of Hygiene and Environmental Health*, 240, 113810.