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SOCIO-ECONOMIC DRIVERS OF WATER SECURITY AND THEIR IMPACTS ON WELLBEING IN CENTRAL PUNJAB

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Abstract

Domestic water security is pivotal for ensuring human well-being; encompassing access to safe and reliable water resources This study investigated the socio-economic drivers of domestic water security and their impacts on household well-being in Central Punjab using a mixed-method approach. Data from 496 households were analyzed using SPSS. Results showed that income, age, and locality significantly affected access to clean water and overall well-being..." Socio-economic variables such as age, level of income and disparities in access of water. A multistage sampling technique was used to select the sample. At the first stage two districts were selected purposively from the central Punjab i.e. Lahore and Faisalabad. At second stage two tehsils were selected one from each district though purposive sampling technique. At third stage of sampling 4 union/city councils (2 from each tehsil) were selected purposefully. At fourth stage four localities were selected through purposive sampling technique. A sample of 496 respondents was selected randomly with the Fitz Gibbon table and counter verify through the online website calculator at the 5 percent error. Additionally, quantitative data was collected by using a well-organized interview schedule, while qualitative data was collected through four focus group discussions (FGDs) or an interview guide. SPSS was employed to analyze the data that has been collected. Thematic, descriptive, and inferential analyses were implemented to illustrate the findings. The findings highlight that socio-cultural factor, including age and income have a profound impact on physical health, mental well-being, and economic stability. The implications call for integrated policy interventions that prioritize equitable access to water resources and water-based governance to enhance domestic water security and improve overall well-being in the region. This research provides a foundation for future studies and policy formulation aimed at addressing water security challenges in similar socio-economic contexts.

Keywords: water security, drivers, well being, sustainable development goals

INTRODUCTION

UN-Water (2013) defined water security as the ability of a community to ensure reliable access to enough safe water. This is important for people's daily needs, well-being, economic growth, protection from water-related pollution and disasters, and for keeping ecosystems healthy in a peaceful and stable political environment. "Having enough clean water for work, living, and health, along with a reasonable risk of unexpected problems related to water."

The fast loss of surface water and groundwater, along with more frequent and severe droughts, has made water security an important problem around the world. This is because of poor water management, greater impact from climate change, more people, changes in how people live, and economic growth. The problem is made worse by the quick decline of freshwater environments caused by bad environmental management, more water pollution, and less natural water flow, leading to a loss of aquatic wildlife Bănăduc *et al*. (2022).

According to the United Nations, over 2 billion people globally lack access to safely managed drinking water services, and an estimated 4.2 billion people live without safely managed sanitation. These inequalities are often exacerbated by factors such as poverty, geographic location, and governance issues. (UN, 2021).

The United Nations General Assembly included water security in the Sustainable Development Goals (SDGs) because they thought a worldwide water disaster was about to happen. Water security means that a community can ensure steady access to enough clean water for people to survive, for economic growth, for cultural development, to protect against water-related pollution and disasters, and to support ecosystems, all while having a stable and peaceful political situation, according to UN-Water (2013). Many studies have shown that achieving water security (SDG6) can help meet other Sustainable Development Goals (SDGs), since water plays an important role in reaching these goals(Di Baldassarre *et al*., 2019; Taka *et al*., 2021).

Water insecurity can have bigger effects on society, like making people sick, destroying ecosystems, making food and energy shortages worse, and even starting wars in places with little water. It will also hurt women and girls in developing areas more than men and boys because they are usually the ones who fetch water and do other tasks like taking care of family members who are sick from water. This keeps them from going to school or getting another job, which makes gender inequality and poverty worse. Winter *et al*. (2021). Lack of schooling for women and girls could make water governance less gender-inclusive, which would make it harder for them to get water and

sanitation services Bhattarai*et al*. (2021). Because of these many problems, the race to ensure water security, especially in developing areas, has become one of the top goals for governments and global policy institutions. It has also become a major topic of interest in science in recent years.

Implication of domestic water security for well being: The time and effort required to secure water often falls disproportionately on women and girls, limiting their opportunities for education and economic participation. Azmat and Hasan (2018). This perpetuates cycles of poverty and social inequality, further undermining the well-being of these communities.

Inadequate access to safe water is linked to various social, economic, cultural, and environmental repercussions. The health, social, and environmental challenges stemming from insufficient access to safe water and sanitation are unevenly distributed across global, regional, national, and local contexts (Allin and Hand, 2014).

Water scarcity is also a significant factor in agriculture worldwide, as over 1.2 billion individuals reside in regions with physical water scarcity, which means they are unable to meet their daily water requirements. Although there is a wealth of evidence demonstrating the detrimental effects of water insecurity on the psychological state, physical health, personal beliefs, social relationships, and human-environment interactions, we have yet to gain a comprehensive understanding of how water insecurity affects the overall evaluation of a population's life. This may be due to the fact that the pathways and mechanisms by which water insecurity impacts overall wellbeing and its dimensions have not yet been completely conceptualized or articulated. The effects of water insecurity are frequently multifaceted, and households may not separate them into divisions, but rather perceive them as a cohesive entity. Hunter (2010) notes that there have been few attempts by researchers and practitioners to conceptualize, quantitatively measure, and assess any relationships between water security and overall wellbeing, despite the holistic comprehension of water.

Objectives of the Study

- To study the socio-economic attributes of the respondents
- To explore how domestic water insecurity effects on various dimensions of human well-being
- To provide evidence-based recommendations for policymakers and stakeholders aimed at enhancing domestic water security in Central Punjab.

MATERIALS AND METHODS

The study was conducted in central Punjab, Pakistan. The reason for the selection of central Punjab specifically is that here WASA function on water networking is high. Both qualitative and quantitative research designs will be applied to collect the data. A multistage sampling technique was used to select the sample. At the first stage two districts were selected purposively from the central Punjab i.e. Lahore and Faisalabad. At second stage two tehsils (one from each district)Lahore City and Faisalabad City were selected though purposive sampling technique. At third stage of sampling 4 city councils (2 from each tehsil) were selected purposefully. At fourth stage four localities were selected from these four UCs through purposive sampling technique. Whereas, the area already selected purposively, the sample of 496 respondents was selected randomly with the Fitz Gibbon table and counter verify through the online website calculator at the 5 percent error. Additionally, quantitative data was collected by using a well-organized interview schedule, while qualitative data was collected through four focus group discussions (FGDs) or an interview guide.

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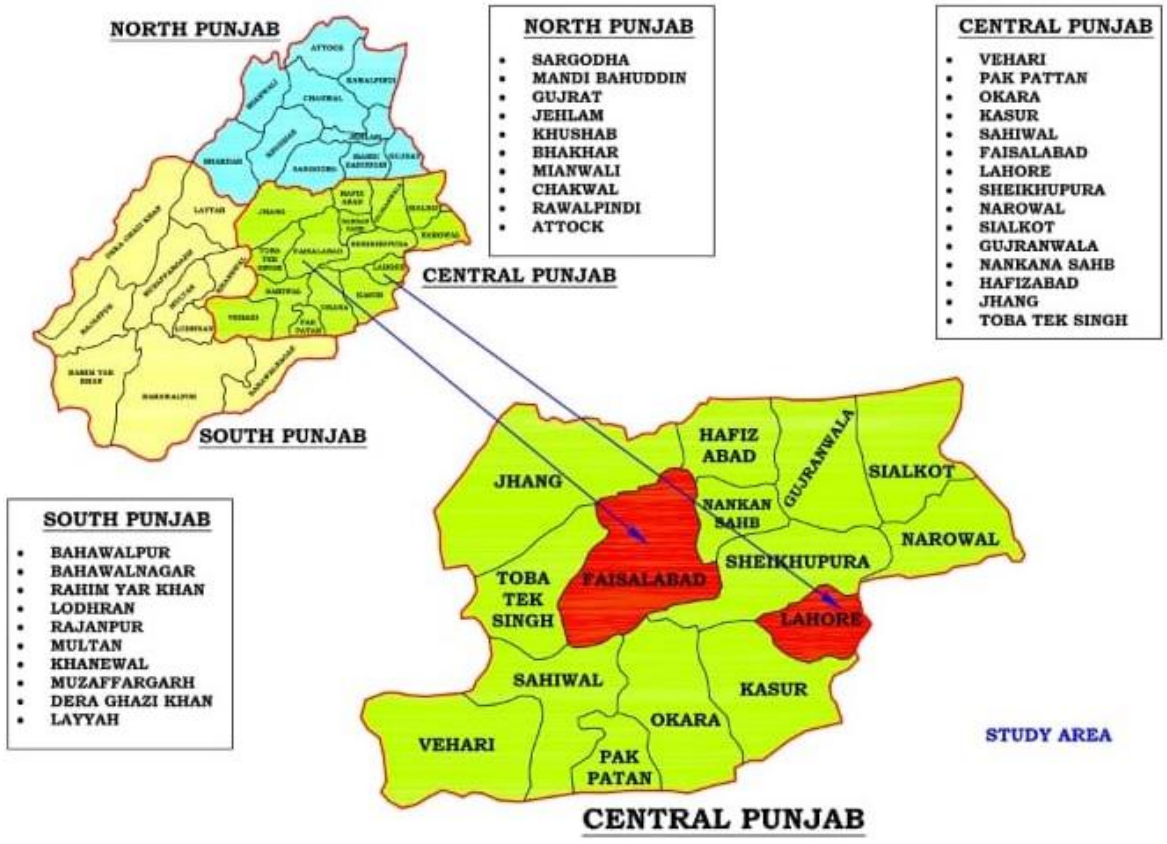

Results and discussion

Table 1: Distribution of respondents according to their age (Years)

Age	Frequency	Percentage
18-24	85	17.1
25-30	132	26.6
31-36	215	43.4
37 and above	64	12.9
Total	**496**	**100**

Table 4.1 displays a breakdown of responders by age. People aged 31 to 36 made up the majority of the responders i.e. 43.4%. 26.6 percent of the respondents completed 25-30 years of age, 17.1 percent in between 18-24 and 12.9 percent had 37 and above years of age. Results had linked with the study conducted by Bloom and Canning (2014) who defined there are young people in the Pakistan are greater in number and this opportunity for made over a time period of about forty to fifty years during which, the proportion of

dependent children is reduced and the population with the age of youth significantly increases.

Table 2: Distribution of respondents according to their Household Income from all resources per month

Household Income	Frequency	Percentage
Up to 30000	92	18.6
30001—70000	173	34.9
70001—100000	147	29.6
100001 or above	84	16.9
Total	**496**	**100**

Table 4.8 depicts the distribution of respondents based on their total monthly income. The largest group, with reported monthly incomes ranging from $30,001 to $70,000, accounted for 34.9% of the total. A sizable percentage, 29.6%, earned between $70,001 and $100,000 each month. Meanwhile, 16.9% of respondents earned $100,000 or more, while 18.6% had a household income of up to $30,000. According to this distribution, the majority of households have a median income.

According to findings similar to those of Bloom and Canning (2014), the improvement in macroeconomic activity in East Asian nations is closely linked to shifting trends in demographic transition and age structure. Jobs that are tailored to an employee's skills and abilities improve performance, which in turn boosts the firm's output and creates prosperity. The compensation package is updated and household income rises when the company's profit is increased.

Hypothesis: Higher the age of the respondents, higher will be the effects of water security on well-being

Table 3: Association between age and well-being

Age (Years)	Well-being			Total
	To a great extent	To Some extent	Not at all	
18-24	93	12	13	118
	19.8%	2.3%	2.5%	24.6%
25-30	92	49	9	150
	20.0%	9.4%	1.7%	31.2%
31-36	13	78	40	131
	2.5%	16.9%	7.7%	27.1%

37+	29	38	30	97
	5.8%	7.3%	7.7%	19.5%
Total	227	177	92	496
	45.7%	36.0%	19.6%	100.0%

Test	**Value**	**D. F.**	**P. Value**
Chi-Square	117.23	6	< 0.001
Gamma	0.721	--	+1
Highly Significant			

Table 3illustrates the relationship between the age and well-being of the respondents. The hypothesis, "Age and well-being are dependent," is accepted based on the chi-square value which indicates a high significant relationship between the variables. The gamma value of 0.721 indicates a rather positive significant correlation between the variables. Older adults are more susceptible to the effects of water insecurity because of age-related physiological changes. For instance, they are at a higher risk of dehydration due to diminished thirst sensation and reduced renal function (El-Sharkawy*et al*., 2015).

Water insecurity disproportionately affects older adults in low-income and resource-scarce settings. Limited access to water may force them to rely on others for assistance, reducing their autonomy and increasing their vulnerability to neglect or social isolation. Studies also show that older adults on fixed incomes may struggle with rising water costs, further affecting their ability to maintain their well-being (Jepson *et al*., 2017).

Hypothesis: Higher the household income, higher will be the well being

Table 4: Connection between household income and well being

Income (Rs.)	**Well-being**			**Total**
	To Great extent	**To Some extent**	**Not at all**	
Up to 30000	48	26	20	91
	9.2%	5.2%	3.8%	18.3%
30001—70000	115	10	9	134
	26.0%	1.9%	1.7%	29.6%
70001—100000	36	110	21	167
	6.9%	23.5%	4.0%	34.4%
100001 or above	12	47	42	101

	2.3%	9.0%	10.0%	21.3%
Total	211	193	92	496
	44.4%	39.0%	19.6%	100.0%

Test	**Value**	**D. F.**	**P. Value**
Chi-Square	182.45	6	< 0.001
Gamma	0.721	--	+1

The relationship between household income and the human well-being is explained in Table. The chi-square score indicates a highly significant relationship between the variables. The gamma value indicates a significant positive correlation between the variables and characterizes their intensity. As a result, research hypothesis is accepted that higher income level greatly influences the human well-being.

Statistics that matched those of (Jahantab.2021) revealed a relationship between a well-being and its level of education, employment, and income. He asserts that a nation cannot advance without making sufficient investments in its citizens' education. Increased investment in education opens up employment opportunities that raise income levels through higher incomes and propel the nation forward.

The relationship between income and well-being is well-documented, with higher income levels often associated with improved well-being due to better access to resources, health care, and opportunities for social and cultural participation. Increased income positively correlates with life evaluationa person's overall assessment of their life—up to a certain threshold, after which the impact diminishes. However, subjective emotional well-being, such as daily happiness or stress levels, may not significantly improve beyond this point. Furthermore, contributing to poorer health outcomes and reduced life satisfaction (Finkelstein,2022). Thus, while income is an essential determinant of well-being, its influence is moderated by factors like income distribution, social context, and individual perceptions.

Conclusion:

This study provides a comprehensive analysis of the predictors of domestic water security and their implications for human well-being in Central Punjab, Pakistan. The findings highlight the complex interplay of socio-economic

factors in determining water security at the household level. Key predictors identified include household income and age.

The analysis concluded that domestic water insecurity has far-reaching consequences for social and economic stability. Households with limited access to clean and reliable water sources face increased health risks, including waterborne diseases and dehydration. Mental stress and anxiety related to water scarcity and quality issues were also reported, highlighting the psychological toll of water insecurity. Economic repercussions are evident in the form of reduced productivity and higher costs associated with alternative water procurement methods, disproportionately impacting low-income households. Furthermore, the study emphasizes the importance of raising awareness about water conservation and management practices.

Suggestions

Develop region-specific water policies that address the unique challenges of Central Punjab, such as water scarcity and quality issues. Advocate for integrated water resource management (IWRM) frameworks that prioritize equitable distribution and sustainable usage. Emphasize the inclusion of vulnerable populations, particularly low-income households, women, and marginalized communities, in policy formulation and implementation. Propose subsidies or financial incentives to improve access to affordable and clean water for underprivileged households. Try to overcome the water insecurity and public health outcomes, including the prevalence of waterborne diseases.

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