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RESEARCH PAPER

High economic impacts of poor water and sanitation in various communities in Pakistan (an environmental economic perspective)

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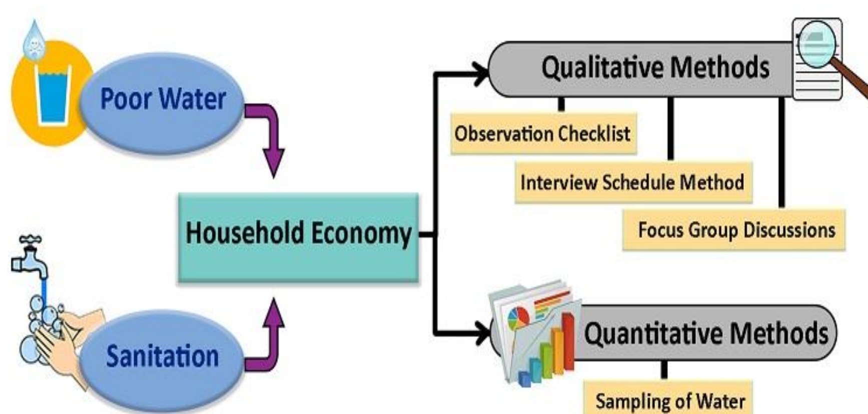
Highlights

- Impact of poor water and sanitation on household economy was investigated.
- Qualitative and quantitative approaches were used to assess the impact of poor water and sanitation on households economy.
- People have not access to proper sanitation facilities in most of the rural settlements.
- The diseases ratio was very high because of poor water and sanitation condition.
- Unawareness of WATSAN related diseases affect adversely on household economy by hospitalization, transportation and medical costs

Graphical Abstract



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Abstract

Large number of residents in Pakistan suffers from adequate access to safe drinking water and proper sanitation facilities. For this purpose, the present study investigates the impact of poor water and sanitation (WATSAN) on household economy. Qualitative and quantitative approaches including data collection using questionnaire method and laboratory tests of water quality were used. Results demonstrate the inhabitants have not access to proper sanitation facilities in most of the rural settlements. Besides, although some WATSAN facilities were available in urban area but the diseases ratio was very high in both studied areas. Therefore, WATSAN related diseases affect adversely on household economy by hospitalization, transportation and medical costs. The present research concludes that due to poor WATSAN facilities the residents in the study area are confronted with food, health and education and living standard obstacles.

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1. Introduction

In developing countries, poor inhabitants frequently suffer from diseases due to inadequate water supply, sanitation and hygiene (Ebadi and Hisoriev, 2017; Nawab et al., 2006). The eighth Millennium Development Goal of United Nations Millennium Declaration reflects the global importance of water sanitation and hygiene for development, poverty reduction, and health improvement (Cook and Bakker, 2012; Raissy et al., 2010; Zhang et al., 2019). In most of the developing countries, the major cause of sickness and death among the young children is diarrheal disease (Ebadi and Hisoriev, 2017; Revelas, 2012). Governments are unable to provide primary needs to the inhabitants, because of the rapid increase in the urban population (O'Neill, 2017; Sarfraz et al., 2019). Increased health problems and greater vulnerability are caused by lower socio-economic status, including water related diseases (Sarfraz et al., 2019; Stephens et al., 1997). There is a great hardship faced by the household residents when the large amount of money is spent on medical expenditure due to illness (Maconachie, 2019). In Nepal economic loss US$153 million equivalent to 4.1% of the GDP is associated with inadequate sanitation in 1996 (Moe and Rheingans, 2006). Economic cost or impact due to poor water and sanitation is divided into eight components which are included in the current and future costs.

1.1. Current and Future costs

Measures that are taken to reduce the risk of diseases such as immunization, comprise direct costs. The cost of transport, medication, room at hospital, medical care, and hospital fee are also the direct costs. Time loss of the sick individual and the care taker; time lost while traveling to the hospital due to death or disease; and suffering of the patient and other family members, as well. The future cost may include Time loss of children due to absentees from school and reduction in learning abilities; Long term disabilities because of chronic morbidity effect, loss in future productivity; Welfare losses because of premature mortality (Brown and Kyttä, 2014).

Medical costs of an illness due to poor water and sanitation (physician care, drugs, and hospitalization costs) also include the indirect cost of lost wages during days missed from work. Medical expenditure on hospitalization, transportation cost of every trip to hospital associated with the cost of fuel and during whole of the productivity loss, all is associated with economic cost of poor water and sanitation greatly affect the household economy (El-Fadel et al., 2003). Government and private sector and NGO's can play a very vital role to promote and support the water and sanitation improvements and interventions. Current population of Pakistan is around 180 million; and only 65% people have access to safe water. Sanitation facilities are available to 42% of population (Zulfiqar and Thapa, 2017). In KPK, 90% of people are living in rural areas, and the population that lives in poverty is more than 36% (Nawab et al., 2006). Throughout the KPK province, the sanitation coverage varies in the 24 districts, that is highest in Chitral district (65%) and lowest in Kohistan district (3%). It is estimated that 63% of households in KPK have access to safe water (Zulfiqar and Thapa, 2017). It is reported that water pollution, poor sanitation, poor housing and low family income are the risk factors for many diseases and create health problems. It is inevitably clear that the households were more forced with poverty when they confronted with essential medical costs, especially costs of household income loss due to ill health.

not paid enough attention in Pakistan. The inhabitants have no access to adequate sanitation facilities in most of the rural settlements and lack toilets and sanitation systems. These poor population, mostly living in rural areas or urban slums, in addition to suffering from financial resources, also lack access to primary requirements including education, health, safe water supply and environmental sanitation facilities. Polluted water, low socio-economic state, poor sanitation coupled with low literacy rates lead to health problems (Hussein and Meerkhan, 2019). The objectives of the present study includes, 1) To find out the causes of poor water and sanitation, 2) To study the impact of poor water and sanitation on the health of people, and 3) To analyze the economic impacts of poor water and sanitation on the household.

2. Materials and Methods

This study seeks to investigate the impacts of poor water and sanitation on health and household economy in Abbottabad, Pakistan. Different tools were used to collect data. Data-collection techniques provide systematic collection of information about people, objects, phenomena as well as settings in which they occurred. Both qualitative and quantitative methods were used in this present research. Also, following approaches were applied in the research:

1. Group discussion with the respondents for valid data collection so that a group of 8-12 informants freely discuss the issue. Through this qualitative method, in-depth information on concepts, perceptions and ideas of a group are obtained.
2. Interview schedule method with the questionnaire helps in knowing the real situation and shortages of the population. Questionnaires were used with a fixed list of questions in a standard sequence. There was a mixture of open and pre-categorized answers.

Interview schedule method was useful for literate and illiterate respondent as it permitted the clarification of questions and enables the collection of more relevant information. Besides, individual observation shows the reality. To gain deep understanding of a particular situation, observation checklist was developed which was effective in conception of other individuals' life situations. Data observed was recorded and noted in the field notes being written on the spot or at the end of the day. Prolonged engagement in the field allowed gathering more detailed and accurate information through observation. Finally, economic analysis was conducted, took averages and means of the obtained values and economic cost of poor water and sanitation was obtained. The various methods applied were qualitative methods that include observation checklist, interview schedule method, and focus group discussions and quantitative methods include sampling of water.

3. Results and Discussion

Fig. 1, shows different sources of income in the study area. It was evident that 43 and 24% of population was employed in urban area and rural area, respectively. 3% were laborers in urban while 52% were in rural area. Overall, 20% population was associated with farming, 37% with business, 3% with livestock, 23% with remittance and 10% with others in the selected urban area. While in the selected rural area, majority of people earned from farming (50%), other income sources comprised business (14%), livestock (10%), remittance (6%) and others (8%). In urban area 27% people visit to specialist and 37% take patients to hospital. While in rural area 6% visit to specialist, 16% visit to local dispenser, 12% to homeopathic and 78% to hospital. As shown in Table 3, 57% people visit government hospital while 77% people visit private hospital in selected urban area. Table 3 shows the annual individual average expenses on different age groups in the selected urban area. Results demonstrate that the higher average expenses were recorded for adults' i.e 25 and above; younger between 11-25; and children 1-10, respectively. Table 1 estimate that how much diseases influence on the household economy especially in low income category. Mostly, in rural area government hospitals are selected by 86% of population which are free of charges and medicines are also some times free, while only 58% of people visit private hospitals. Table 4 shows the higher average expenses for adults of 25 and above age, then on children 1-10 and then young 11-25, respectively in rural area. Figs. 2 and 3 show the average monthly income from different sources.

Table 1. Percentage of people in urban and rural areas visiting the government and private hospitals.

Areas/visit	Sensitivity %	Sampling Frequency %
Urban area	57	77
Rural area	86	58

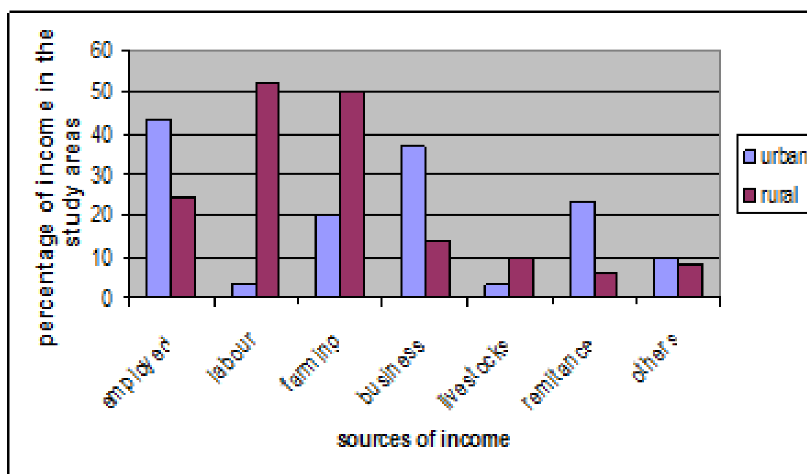

Fig. 1. Sources of income in the study areas.

Table 2. Unit cost of the health in the urban and rural areas.

Areas/cost	Average transportation cost Rs	Average medicines cost Rs	Average doctor fee Rs	Total
Urban	125	730	330	1185
Rural	104	968	267	1339

Table 3. Average annual individual costs in selected urban area.

Children 1-10 Rs	Young 11-25 Rs	Adults 25 and above Rs
4633	5117	6197

Table 4. Average annual individual costs in selected rural area.

Children 1-10 Rs	Young 11-25 Rs	Adults 25 and above Rs
4896	2702	9830

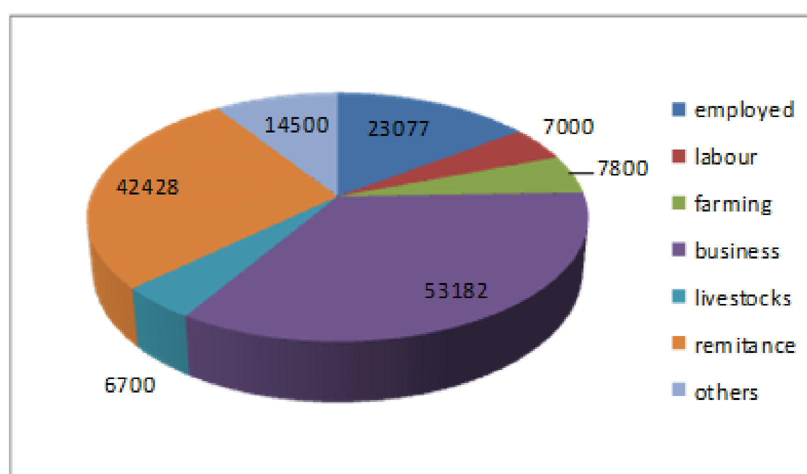

Fig. 2. Average monthly income from sources in selected urban area.

Fig. 3, also shows that in the studied urban areas, mostly peoples source of income is thru employment than business and remittance. While in rural area, the big source of income is laboring than employment and so on. It was evident that people who gain income thru labor, farming and livestock had the lowest income. But most of

the people in urban community depend on employment and business, thus their monthly income was good enough to manage daily life. As mentioned in the income source chart that mostly people gain income by the farming and laboring but what they earn from these sources is the least, thus majority people suffer a lot and live below standard levels. Then, they replied in questionnaires that it is very difficult for them to manage the life and thus they have to compromise on better food, health, life standard, education and on many other things in their life. Figure 4 shows that in selected urban area 70% of people apply traditional methods to treat disease for immediate result. They believe that herbs are effective and good for health and have no side effects. As an old traditional method, they can be good first aid, easy simple, cheap, and reduce medical costs. 46% of selected rural people uses traditional methods to treat different diseases and for that they more or less gives the same answer, according to them there is no need to visit doctor if get relief through these ways but if problem is getting verse then visiting will be Inevitable. It is a quick remedy, cheap, one of the respondent said that medicines can stunt the growth of children so must be avoided, it's our old habit to use it, but some says it is not at all effective and useless.

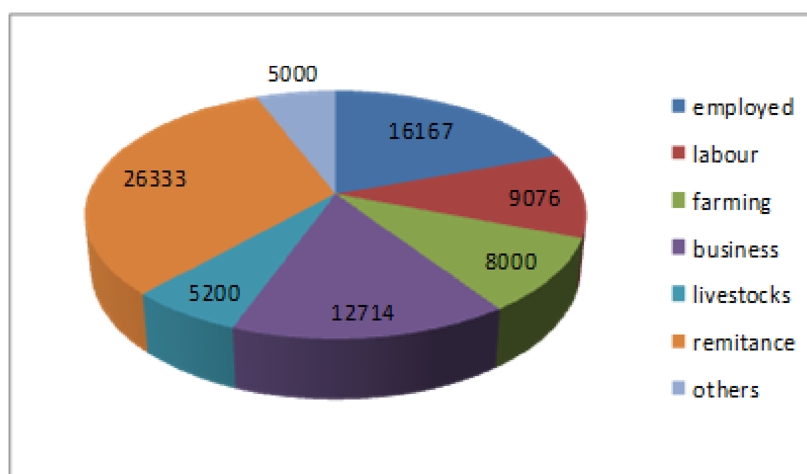

Fig. 3. Average monthly income from sources in selected rural area.

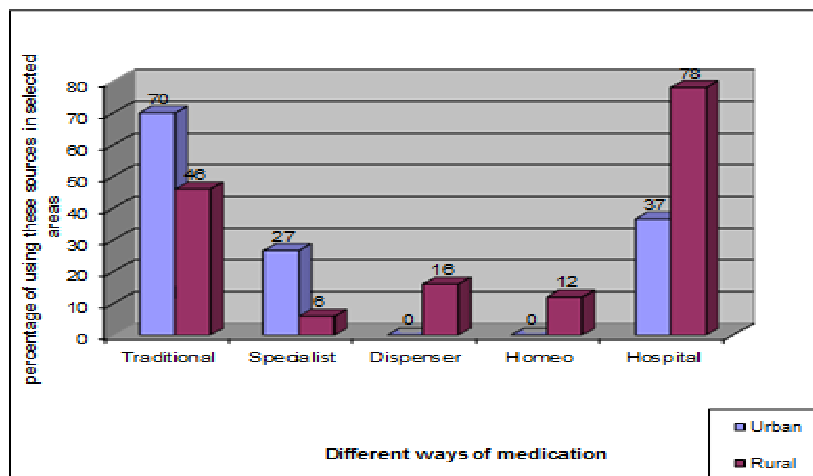

Fig. 4. Routine practices of medication in study areas.

In rural area least number of people visits specialist doctors and more to the government hospital, they prefer household remedies or went to local dispenser, same is the case in urban area, traditional methods are usually followed along with the government hospital but also use to visit specialist doctors, the main reason for that people prefer to treat diseases at home to whatever extent they can is because economic pressure on house hold. Number of visit to private hospital is more because people were not satisfied from the government

hospital treatment and doctors (Asaolu and Ofoezie, 2003). Medical expenditure on hospitalization, transportation cost of every trip to hospital associated with the cost of fuel and during whole of this the productivity lose it all is associated with economic cost of poor water and sanitation and this greatly effect the household economy (El-Fadel et al., 2003). If investment in drinking water and sanitation is done then lots of economic benefits can be obtained, health care savings US$ 340 million for individuals, and for 15 to 59 years age group 320 million productive days gain (Cook and Bakker, 2012; Zhang et al., 2019).

3.1. Expenditure on health for urban and rural population

In urban community they spend 9% of their total income on health expenses/year. Expenditure on health for rural population is in rural community they spend 18% of their total income on health expenses/year (Table 5).

Table 5. Sources of income and direct economic loss due to water born diseases (Rural area).

S. No	**Sources Of Income**						
	Employed	**Labor**	**Farming**	**Business**	**Livestock**	**Remittance**	**Others** [a]
Respondents	12	26	25	7	5	3	4
Percentage %	24	52	50	14	10	6	8
Days of IPM [b] **Avg.**	2	5	4	3	2	-	-
Income/month (Rs)	16167	9076	8000	12714	5200	26333	5000
Per day income (Rs)	735	304	267	424	173	-	-
Total LWPM [c] **(Rs)**	1470	1520	1068	1272	346	-	-

[a] Pension Rent; [b] Illness per month; [C] Loss of wages per month

Table 6. Direct and indirect cost due to poor to water and sanitation.

Impact category	**Sub-impacts evaluated**	**Direct Economic cost attributable due to poor water and sanitation**	**Indirect economic cost attributed due to poor water and sanitation**
Health	Health care costs	Full costs of health seeking, including formal health care services and traditional healers	Stress Time loss Family effect Care in food/sometime special food prepared for ill person Traveling cost of family welfare cost
	Productivity costs	**Welfare or income loss due to adult and child sickness time**	**School absentees** Physical **strength** (reduced due to **diseases)**

3.2. Direct and Indirect cost due to poor water and sanitation

It is noted that indirect cost may not be quantifiable and varies from person to person and household to household, therefore the indirect cost has not been calculated in figurative form. These are costs on households either direct or indirect costs because of which there is great impact on household economy. This study would help to know if the disease ratio is reduced by having good water, sanitation and hygienic practices that will have great impact on raising household economy and one would be able to live with good life, high education

and better life standards. The study shows the 42-48% reduction in diarrhea diseases, with an intervention focused on hand washing involving soap (Cairncross et al., 2010; Waddington and Snilstveit, 2009). The reduction in diarrheal disease morbidity is 20 to 30% due to water quality and hygiene interventions, this is the great impact of water, sanitation hygiene intervention (Brown et al., 2013; Ives and Lawrence, 2018). To reduce the use of unimproved sources of water and use improved water quality, can reduce the disease burden (Table 6).

4. Conclusions

The present study concluded that the water and sanitation condition in urban, as well as in rural community of Pakistan is very poor. However, in case of rural community its more worst than urban community, in terms of sanitation, no garbage collection points, lack of gray water management, uncovered and garbage filled drains. Income from the sources is less compared to the expenditure of the house especially in management of waterborne diseases treatment. In rural and urban areas people are spending 18 and 9% of their total income on health because of water borne diseases, respectively.

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