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Availability Problem of Drinking Water in an Urban Area - Effects of Family Size and Monthly Income: An Empirical Study

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Abstract
The availability of water is a major problem faced by the urban masses and policy makers. Bridging the gap between the demand for and supply of water is a major policy decision confronted by the urban authorities. The ever-increasing urban population and shift in occupational structure results in the increased demand which confronts with lagging supply of water which needs immediate policy attention. The present study is based on the survey of households in urban areas who have piped water connections in their homes. 600 households were selected at random from the total connections available. The data is analysed using the x^2 test. The present study aims at examining the relation between size of the family and income of the respondents with that of severity of availability problem of water and comes to the conclusion that severity problem is not connected with the size of the family size but it is connected with the family income of the consumers.

Keywords: Urbanization, Water, Availability Problem, Population, Demand for Water, Supply of Water

Introduction

One of the main problems that accompany urbanization and development is the availability of and demand for necessities of life. Among these necessities water is to be separated as this is the most essential element for the existence of human beings. India is a country with a long tradition of conserving and sustaining water. But the population of India is growing at an alarming rate and the urban areas of the country need to find out new sources of drinking water to meet the ever increasing demand for water. Kerala is a state which is endowed with natural beauty and rich water resources. But the urbanization process in Kerala is very fast which has resulted in a shift in employment from agriculture to other sectors and concentration of people in areas adjacent to urban areas. This has resulted in increased demand for water and the supply of water is not increasing in pace with demand for water.

Urban centres in India present a grim picture with regard to availability of basic services (Mathur and Chandra). The Kerala society by and large can be termed as urbanized and the urbanization process in Kerala acquired a faster pace during the latter half of the last century (George). Barring a few panchayaths in the hilly tracts and a few isolated areas here and there, the entire state depicts a picture of a rural-urban continuum. According to the 2011 Census, urbanisation has increased faster than expected. This has reversed the declining trend in the growth rate of the urban population observed during the 1980s and 1990s. Also, for the first time since independence, the absolute increase in the urban population was higher than that in the rural population.

This has huge implications for providing infrastructure and other civic amenities in urban areas. A radical thinking on water has become necessary because there has been serious mismanagement of water in the country. There are serious problems leading to near crisis with the water policy. Intermittent, unreliable, unsafe and inequitable water supply in urban areas is a common feature. Large number of people lack access to safe drinking water and decent sanitation (Iyer).

With increase in the income of the consumers the availability problem also increases as the consumers own more consumer gadgets as income increases and the higher income groups have higher storing capacity. With the increase in the family size of the households the water used for different purposes will increase and utilisation pattern will also change. With increase in the family size water used for domestic purposes will increase and thus will aggravate the availability problem. The present study aims to find out the relationship between the increased family size and the availability problem of water in an urban area in Kollam District of Kerala. Urban areas in Kollam District consists of 5 municipal areas in which there are many urban water supply schemes and the demand for water is very high than of the supply of water.

Methods of Sample Selection

The study is based on the survey of households in urban areas who have piped water connections in their homes. 600 households were selected at random from the total connections available. The sample size was fixed at 1.5 percent of total connections and rounded to nearest 100. The data was analysed using the x^2 test and multiple regression analysis.

Objectives of the Study

1. To examine whether severity problem increases with increase in the family size of the households.
2. To examine whether the severity of drinking water problem increases with increase in monthly income of the households.

Results

Table 1 indicates that the chi-square value was not significant for family size, but the implications of this result could be elaborated further. Similarly, the chi-square value for income levels is significant, but more discussion is needed on how this finding can inform urban planning decisions. It is a general notion that as the size of the family increases more water will be consumed and the availability problem of water to a family will increase. Based on this presumption it was decided to check whether the size of the family can increase water availability in an urban area. To check whether the family size is a factor which contributes towards increase in water availability problem x^2 test is done. Dependency of the severity of the drinking water problem on the family size is checked by using x^2 test.

Table 1 Association between Severity of the Drinking Water Problem and Family Size

Severity	Family Size			
	1-4		Above 4	
	Count	%	Count	%
Very Severe	114	33.1	88	34.4
Somewhat Severe	211	61.3	149	58.2
Not severe	19	5.5	19	7.4
Total	344	100.0	256	100.0
$x^2 = 1.142^{NS}$; df = 2; P = 0.565				

NS - Non significant

H_0: Availability problem is not associated with size of the family

Here the null hypothesis is that availability problem is not associated with the size of the family. Since the P-value is higher the null hypothesis is accepted that there is no association between availability problem and size of the family that is availability problem is not depending on the size of the family. It is not the family size of the respondents that affect the water availability but the total population in urban areas is a major factor contributing towards water availability. The percapita demand for water in an urban area is very high but the supply of water is not coping up with the demand. The actual consumption of water is much below the norms fixed by the CPHEEO (Suprabha). The actual policy needed is the augmentation of the existing supply sources by the government for meeting the water demands of the ever increasing the population.

Association between Severity of the Drinking Water Problem and Monthly Income

The shift in the occupation of the people from primary sector to other sectors of the economy brings about changes in and increases in the income of the households. Increase in the income of the households will lead to an increase in the number of household gadgets used and increase in the type and size of the houses. This will lead to increase in the demand and use of water and increase the severity of availability problem. Monthly income is an important factor which contributes towards increase in water consumption. As income increases more consumer durables will be purchased and the size of the dwelling of the consumers will also increase. As the consumer durables like washing machines and other modern gadgets need more water to operate the water consumption will also increase which will contribute towards severity of the availability problem. Whether the severity of drinking water problem increases with increase in monthly income of the respondent is checked .It is seen that with increase in income more consumer durables will be owned by the respondents and more water will be consumed while operating these durables. The association is statistically checked using x^2 test and is presented in Table 2.

Table 2 Association between Severity of the Drinking Water Problem and Monthly Income

Monthly Income	Severity of the problem						Total
	Very Severe		Somewhat Severe		Somewhat Severe		
	Count	%	Count	%	Count	%	
< 5000	117	36.2	194	60.1	12	3.7	323
5000-10000	45	29.2	96	62.3	13	8.4	154
10000-15000	18	42.9	23	54.8	1	2.4	42
Above 15000	22	27.5	46	57.5	12	15.0	80
x^2 = 18.973** df = 6 P < 0.001							

** Significant at 0.01 level

H_0: Availability problem is not associated with income of the family

Here the null hypothesis is that availability problem is not associated with income of the family. The P value is less than the level of significance and hence the null hypothesis is rejected. (x^2=18.973, df=6, P<0.001). Hence it can be inferred that the availability problem increases with increase in the income of the respondents. With increase in the income of the households the consumption of water also increases. The policy measures should concentrate on promoting the use of household gadgets that will consume less quantity of water and gadgets with water sensors. Subsidies can be provided by the government for the purchase of these gadgets and interest free loans can be provided with hire purchase options.

Factors Affecting Percapita Consumption of Water

Monthly income is an important factor affecting the consumption and availability of water in an urban locality. Besides income there may be various factors affecting the percapita consumption of water and increase in percapita consumption of water will aggrevate the availability problem of water indirectly. Multiple regression equation is fitted for finding out the factors that are influencing the per capita consumption of water. Per capita consumption is taken as dependent variable and family size, income, availability problem, number of taps, number of bathroom, usage of flush in the toilet, slab in which they belongs etc are the factors influencing per capita consumption of water. It is presented in table 3.

Table 3 Factors Influencing the Per Capita Consumption of Water

Variable	Coefficient	Std. Error	Beta	T	p-value
(Constant)	40.779	18.450		2.210*	.027
Family	-6.183	.823	-.292	7.516**	.000
Income	.658	1.744	.019	0.378	.706
Awareness about water problem	.457	5.846	.003	0.078	.938
Payment for water	-4.544	6.084	-.037	0.747	.455
Availability Problem	2.646	1.887	.068	1.402	.162
Water quality problem	-1.785	2.417	-.036	0.739	.460
Daily availability	-.520	3.398	-.006	0.153	.878
Storing facility	-7.304	3.231	-.095	2.261*	.024
Duration of availability	-.147	.584	-.010	0.252	.801
Other sources	12.743	3.583	.173	3.557**	.000
Public tap	22.294	5.012	.161	4.448**	.000
Number of taps	1.505	.771	.112	1.952*	.050
Number of toilets	-5.443	2.235	-.136	2.435*	.015
Capacity of flush	4.506	4.682	.061	0.962	.336
Number of flushes	.215	.592	.022	0.364	.716
Number of baths	3.314	3.117	.041	1.063	.288
Number of cookings	.132	2.766	.002	0048	.962
Number of washes	4.189	2.304	.072	1.818	.070
Water used for washing	.147	.038	.155	3.913**	.000
Use pipe water to clean floor	.654	2.845	.009	0.230	.818
Use water for garden	.253	.063	.156	3.996**	.000
Washing machine	4.999	13.703	.060	.365	.715
Non domestic use	8.464	13.623	.103	.621	.535
Vehicle	-.037	3.420	.000	0.011	.991
Bicycle	-.268	.644	-.016	0.417	.677
Motorcycle/bike	.328	.124	.108	2.646**	.008
Car	.427	.103	.188	4.136**	.000
Others	-.217	.336	-.023	0.645	.519
Other sources free	-6.670	3.657	-.083	1.824	.069
Turbidity	-.640	3.342	-.007	0.191	.848
Brackish	-3.021	2.865	-.041	1.055	.292
Chlorine smell	-1.244	3.070	-.016	0.405	.685
Bad smell	6.163	5.447	.041	1.132	.258
All the above	-4.820	7.072	-.026	0.682	.496
Slab	1.153	1.614	.036	0.714	.476
F-value = 6.889** R = 0.542, and R2 = 0.293					

Source: Analysis of Primary Data

Perusal of data in table 3 shows that among the different variables, family size, using other sources of water, using public tap, using water for gardening, and using water for washing motor cycle or scooter and car was found to be significantly influencing the per capita water consumption. The influence

of these variables is highly significant. Positive sign of the coefficient is indicating that there is a direct influence of the variables on percapita water consumption and negative sign indicate that there is an opposite influence of the variables on per capita water consumption. Storing facility, number of taps in the house, and number of toilets in the house have significant influence on per capita water consumption. All other variables are found to have insignificant influence on percapita water consumption which will in turn increase the water availability problem in an urban area.

Conclusion

The present study aims at examining the relation between size of the family and income of the respondents with that of severity of availability problem of water. The analysis of data using x^2 test gives the conclusion that severity problem is not connected with the size of the family size but it is connected with the family income of the consumers. The increased pace of urbanisation has resulted in the shift of population from agriculture to other sectors and has resulted in the demand for urban water but the supply of water is not increasing in tune with the demand which need urgent policy making and interference from the policy makers. The water demand is increasing with increase in urbanisation and urban incomes. The ever increasing demand for water can be met with increased supply of water or through judicious use of water. The present study also extends its research intentions to role of governments in water conservation in other urban settlements of India and effects lack of improved water supply on the productivity of women and children in urban areas.

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