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RESEARCH ARTICLE

ECONOMIC BURDEN OF WATER BORNE DISEASES IN NORTH KASHMIR-A TEHSIL LEVEL ANALYSIS OF SOPORE-J&K, INDIA

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ABSTRACT

The present study was carried out to find the impact of waterborne diseases on the economy of people residing in Sopore Tehsil of north Kashmir where water quality of different drinking water sources has deteriorated and found not fit for human consumption especially in rural areas where drinking water has been supplied through untreated sources (PHE, Sopore). In a sample of 500 households covering 3185 persons about 32.90 percent were suffering from waterborne diseases like Diarrhea, Hepatitis-A, Gastro intestinal, Dermatitis, Conjunctivitis and enteric fever. The impact of waterborne diseases on the economy of the people in the study area was measured by taking into consideration the loss of number of working days annually and health care expenditure. In the study it was found that about 8.90 percent of average working days are lost annually in all the income groups due to waterborne diseases results an average loss of 7169.41 rupees per person. The lost income accounts for about 7.72 Percent of annual income per household per year. While as total annual economic burden of 3584706.39 rupees from all the income groups of the sample sites of the study area.

INTRODUCTION

Geogens or geographical factors are responsible for various pathogenic diseases which are the outcome of mal-adjustment of people to their environment and hence the change of environmental parameters - physical, social, cultural, and economic conditions and changing life styles are dominant factors in various types of disease causation (Mayer 2008). Waterborne diseases are a serious challenge facing globally especially in developing countries where majority of population lacks basic access to potable drinking water which enhances the poor health and has a direct impact on the human health as well as economy of the people. The non-uniformity in level of awareness, socio-economic development, education, poverty, practices and rituals and water availability add to the complexity of the task (water aid, 2008). Despite an estimated total of Rs. 1,105 billion spent on providing safe drinking water since the First Five Year Plan launched in 1951, lack of safe and secure drinking water continues to be a major hurdle and a national economic burden. It is estimated that around 37.7 million Indians are affected by waterborne diseases annually, while as 73 million working days are lost due to waterborne disease each year. The resulting economic burden is estimated at \$600 million a year (Indira Khurana and Sen-2008). It is estimated that about 21 per cent of communicable

disease in India are water related. It is mainly because the availability of water, particularly in rural India depends on untreated surface ground water. (WHO, 2008). The state of Jammu and Kashmir too has high prevalence of waterborne diseases as protective and potable drinking water is not available to all people. It is estimated that more than fifty per cent population of Jammu and Kashmir continues to remain vulnerable to water borne diseases in absence of stringent laws and regulation pertaining to protection of water bodies and civic rules like sewage disposal, building permissions and others which collectively aggravates the incidence of water borne diseases. The prevalence of such water borne diseases in the Sopore Tehsil is assuming a public health problem (Khuroo, 1990).

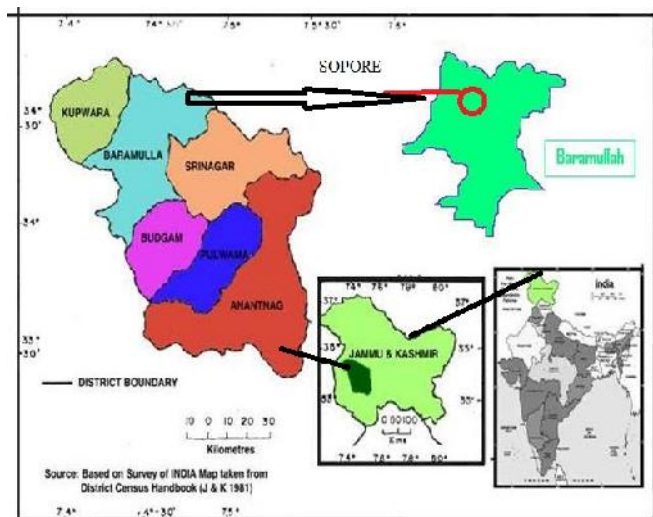
Study Area

The study has been carried out in Sopore Tehsil of north Kashmir, where Water quality was found contaminated and its ill impacts were seen on the human health from the past years (Sub-District Hospital Sopore.2014). Sopore known as suyyapur in antiquity is a prosperous Tehsil in the Baramulla district of the state Jammu & Kashmir. It is located at 34⁰30'N latitude, 74⁰47'E longitude, constitutes an area of 320sq.kms.

Objective

To determine the impact of waterborne diseases on the economy of people.

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Map 1. Map of the Study Area

MATERIALS AND METHODS

The objective was achieved by employing both primary as well secondary data. Secondary data includes Census 2011 J&K, Reports of Directorate of Economic and Static J&K (2013-14) and Reports of Directorate of Health J&K (2012-14). Primary data was collected through field survey of 500 households with well-designed semi structured questionnaires containing parameters to evoke informant's everyday life such as socio-economic aspects and health status. The impact of waterborne diseases on the economy of people was gauged through: No. of working days lost annually and Average health care expenditure per year to cope waterborne diseases. Maps were digitized in GIS the environment using ARC GIS10.2, ERDAS IMAGINE 9.

Study Sites

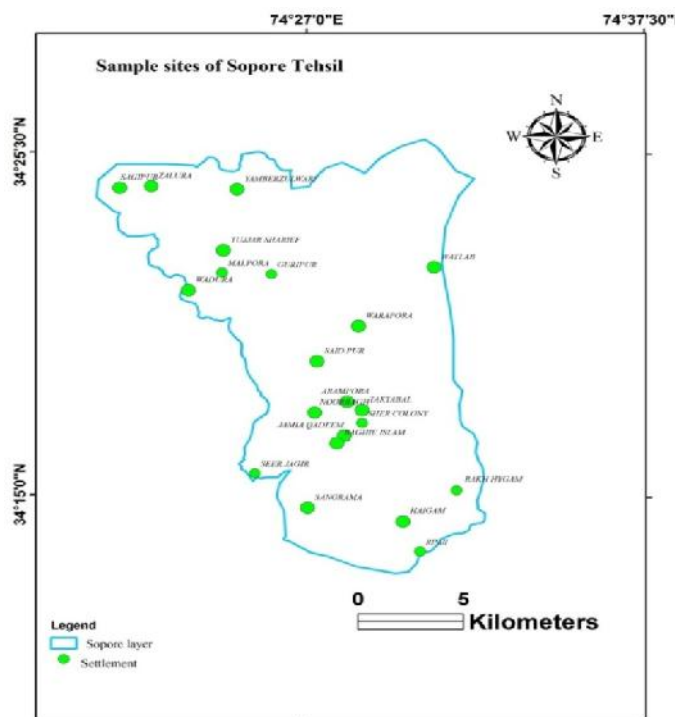
The sample sites were chosen by grouping settlement into different zones according to the household size: 0-250, 251-500, 501-1000 and above 1001. Out of the total 33559 households (Census 2011) in the study area, 1.5 percent of it was taken as sample unit which accounts as 500 households. Adopting systematic sampling technique twenty one study sites were selected such as:

Yamberzulwari, Wadura, Rinji, Rakh Hygam, Watlab, Malpora, Goripur, Sagipur, Sangrama, Saidpur, Warpora, Zalura, Hygam, Seer Jagir, Tujar Sharief, Jamia Qadeem, Takyabal, Baghie Islam, Noorbagh, Shercolony and Arampora show in the map 2.

RESULTS

Various socio-economic parameters were taken into consideration for assessing the impact of waterborne diseases on the economy of the people of Sopore Tehsil.

- Population
- Education
- Occupation
- Annual income
- No. of Working days lost annually
- Average Health care Expenditure per year



Source: (i) Topo sheet 1971(ii) Municipal map of Sopore town

Map 2. Sample Sites of Sopore Tehsil

The table 1 highlights the total population of Sample sites. In survey of 500 households a total of 3185 persons were recorded from the field survey in which 52.68 percent were male population having a sex ratio of 892 (field survey 2014). From table 3 out of total population in the study sites worked population constitutes 53.14 percent from which 61.74 percent were engaged in primary activities which will clearly have an impact on their annual income due to loss of any working days as majority of the population resides on their daily routine of work for their and family survival. Proportion i.e. 56.36percent of the total cases during the survey while as diarrhea constitutes 24.36percent Hepatitis-A 10.90percent and enteric fever 8.36percent. The below figure shows the prevalence of waterborne diseases in sample sites which are categorized into High (6-8 percent), Medium (4-5.99 percent) and Low (2-3.99 percent). The above table shows the number of working days lost due to waterborne diseases in a year and its impact on the economy of people falling under different income groups. The weighted mean was adopted to gauge the impact of working days lost on the economy. The income groups were categorized into three groups on the basis of their income. The total number of households (TH) falling under various income groups were placed accordingly. Numbers of working days lost were also arranged into three groups depending on the response of the households shown in the above table. In the study it was found that 8.89 percent of average working days were lost annually in all the income groups per year resulting an average lost of 7169.41 rupees in all the income groups per year. In the study it was also found that that people with income ranging from 50000 -100000 lost 3.41 per cent of their annual income, while people with income ranging 100000-300000 lost 2.02 per cent of their income and people with income ranging 300000 and above loss 2.58 per cent of their income on combating these water borne diseases annually adding more concerns to the lower income groups. About 7.72 percent lost of annual economic were recorded in all the income groups.

Table 1. Total Population of Sample Sites in Sopore Tehsil (2014)

Villages/wards	No. of Households	Male Population	Female Population	Total Population
Yamberzulwari	24	73	71	144
Wadura	24	71	67	138
Rinji	24	92	86	178
Rakh Hygam	24	82	72	164
Watlab	24	84	69	153
Sangrama	24	84	69	161
Goripur	24	72	74	146
Sagipur	23	70	58	128
Malpora	23	78	69	147
Jamia qadeem	24	80	73	153
Saidpur	22	67	57	124
Takyabal	22	72	54	126
Baghie islam	22	73	70	143
Noorbagh	22	77	66	143
Shercolony	22	84	60	144
Zalura	23	77	67	144
Warpora	23	85	69	154
Arampora	22	82	65	147
Hygam	28	92	89	181
Seer jagir	28	88	97	185
Tujar sharief	28	95	87	182
Total	500	1678	1497	3185

Source: Field survey2014

Table 2. Education Status of Sample Sites of Sopore Tehsil (2014)

Villages/wards	No. of Households	Total Population	Illiterates	Middle	High	Secondary	Tertiary
Yamberzulwari	24	144	47.22	36.2	7.74	8.4	2.85
Wadura	24	138	31.15	25.35	15.94	27.56	12.12
Rinji	24	178	44.4	28.64	16.29	10.67	10.47
Rakh Hygam	24	164	35.36	35.69	9.75	19.2	8.75
Watlab	24	153	35.29	28.75	19.60	16.36	8.53
Sangrama	24	147	44.21	28.57	10.20	17.02	10.46
Goripur	24	146	34.93	28.07	18.49	18.51	6.02
Sagipur	23	128	33.59	26.56	14.84	25.01	9.52
Malpora	23	161	32.29	24.6	13.04	31.05	22.98
Jamia qadeem	24	153	35.94	31.36	15.03	17.67	15.78
Saidpur	22	124	37.90	39.51	12.90	9.69	9.52
Takyabal	22	126	36.50	30.71	12.09	20.7	6.32
Baghie Islam	22	143	29.37	26.56	15.38	28.69	17.94
Noorbagh	22	143	29.37	31.46	11.88	27.29	27.63
Shercolony	22	144	37.5	34.02	13.88	14.85	4.34
Zalura	23	144	37.5	40.27	6.94	15.29	5.79
Warpora	23	154	37.66	37.65	13.63	11.06	13.41
Arampora	22	147	34.01	29.92	22.44	13.63	10.95
Hygam	28	181	31.49	19.66	16.67	32.25	10.57
Seer jagir	28	185	49.27	15.13	16.75	19.45	10.34
Tujar sharief	28	182	40.10	31.31	13.18	15.41	8.60
Total	500	3185	37.11	29.70	14.19	19	16.00

Source: Field survey 2014

Table 3. Occupation status of Sample sites of Sopore Tehsil (2014)

Villages/wards	No. of households	Total Population	Total worked population	Primary	Secondary	Tertiary
Yamberzulwari	24	144	48.61	78.57	18.57	2.85
Wadura	24	138	47.82	72.72	15.15	12.12
Rinji	24	178	58.98	68.57	20.95	10.47
Rakh Hygam	24	164	48.78	77.5	13.75	8.75
Watlab	24	153	53.59	78.04	13.41	8.53
Sangrama	24	147	58.50	73.25	16.27	10.46
Goripur	24	146	56.84	74.69	19.27	6.02
Sagipur	23	128	49.21	60.31	30.15	9.52
Malpora	23	161	54.03	54.02	22.98	22.98
Jamia qadeem	24	153	49.67	44.73	39.47	15.78
Saidpur	22	124	50.80	76.19	14.28	9.52
Takyabal	22	126	62.69	73.41	20.25	6.32
Baghie Islam	22	143	54.54	46.15	35.89	17.94
Noorbagh	22	143	53.14	48.68	23.68	27.63
Shercolony	22	144	47.91	52.17	43.47	4.34
Zalura	23	144	47.91	79.71	14.49	5.79
Warpora	23	154	53.24	68.29	18.29	13.41
Arampora	22	147	49.65	50.68	38.35	10.95
Hygam	28	181	57.45	76.29	12.5	10.57
Seer jagir	28	185	62.70	69.82	19.82	10.34
Tujar sharief	28	182	51.09	67.74	23.65	8.60
Total	500	3185	53.34	61.74	22.24	16.00

Source: Field survey 2014

Table 4. Annual Income status of Sample sites of Sopore Tehsil (2014)

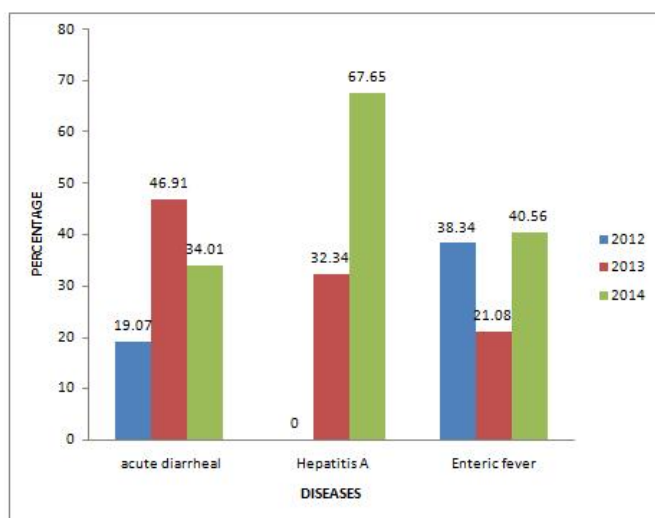
Villages/wards	No. of households	50000-1lac	1lac-3lac	3lac -8lac
Yamberzulwari	24	20.83	58.33	20.83
Wadura	24	8.33	54.16	37.5
Rinji	24	33.33	45.83	20.83
Rakh Hygam	24	33.33	54.16	12.5
Watlab	24	20.83	45.83	33.33
Sangrama	24	16.66	41.66	41.66
Goripur	24	20.83	50	29.16
Sagipur	23	13.04	43.47	43.47
Malpora	23	13.04	65.21	21.73
Jamia qadeem	24	8.33	50	41.66
Saidpur	22	18.18	45.45	36.36
Takyabal	22	18.18	50	31.81
Baghie Islam	22	0	54.54	45.45
Noorbhagh	22	0	27.27	72.72
Shercolony	22	30.28	50	18.18
Zalura	23	17.39	56.52	26.08
Warpura	23	21.79	60.82	17.39
Arampora	22	9.09	54.54	36.36
Hygam	28	14.28	53.57	32.14
Seer jagir	28	17.85	46.42	35.71
Tujar sharief	28	14.28	42.85	42.84
Total	500	16.8	49.8	33.4

Source:Field survey 2014

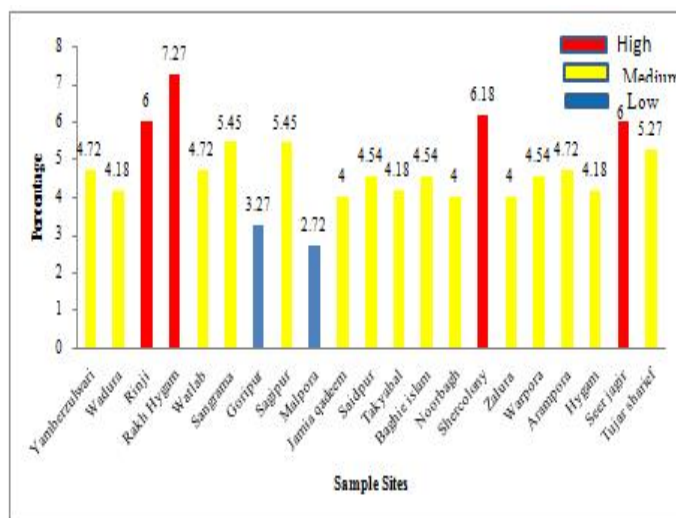
Table 5. Yearly Report of Waterborne Diseases in Sopore Tehsil (2012-2014)

Year	Acute diarrheal	Percentage of acute diarrheal	Hepatitis A	Percentage of Hepatitis	Enteric fever	Percentage of enteric fever
2012	4725	19.07	0	0	571	38.34
2013	11623	46.91	87	32.34	314	21.08
2014	8426	34.01	182	67.65	604	40.56
Total	24774	100	269	100	1489	100

Source: Sub-District Hospital Sopore (J&K), (Manzoor A. Wani).



Source: Sub-District Hospital Sopore (J&K)



Source: Field survey 2014, Medical record

Fig. A. Yearly Report of Waterborne Diseases in Sopore Tehsil (2012-2014)

Fig. B. Prevalence of Waterborne Diseases in Sample Site

Table 7. No. of working days lost due to water borne diseases (2014)

Income groups	TH	Avg. daily income	No. of Working Days Lost/Year			Avg. working Days Lost	Avg.loss of income/hh/yr.	Total Economic Burden	Percent age loss/hh
			1-10	10-20	20-30				
50k-1lac	84	137-273	34	37	13	12.5	2562.5	215250	3.41
1-3lac	249	273-821	200	40	9	7.32	4004.04	997005.96	2.03
3-8lac	167	821-2192	100	60	7	9.3	14206.29	2372450.43	2.58
Total	500	-	334	137	29	8.89	7169.41	3584706.39	7.72

Source: Field survey2014

Table 8. Health care expenditure on water borne diseases in Sopore Tehsil (2014)

Income groups	Total Households	Avg. daily income	Health Care Expenditure/Year				Avg. Health Care Expenditure
			0-500	500-1000	1000-1500	>1500	
50k-1lac	84	137-273	2	12	21	49	109,250
1lac-3lac	249	273-821	2	23	100	124	328,750
3lac-8lac	167	821-2192	0	8	50	109	232,000

The same technique was adopted i.e. weighted mean to measure the health care expenditure to cope the waterborne diseases. It has been seen that average health care expenditure of in the income group 50k-1lac were 109250 rupees per year, while in the income group having income between 1lac-3lac having estimated health care expenditure of 328,750 rupees and income group 3lac-8lac were having a health care expenditure of 232,000 rupees. An overall average health care expenditure in all income groups was estimated 259559 rupees annually (field survey 2014).

Conclusion and Suggestion

Waterborne diseases are not considered to be catastrophic agent of mortality but can slowly and silently affect the human health and with the passage of time will eventually become a serious cause of high mortality in susceptible areas and also will have a negative impact on the economy of the people. The total cases recorded in the Sub-District Hospital Sopore related to waterborne diseases year 2012-2014 were 26532. Acute diarrhea cases constitute 24774 (93.37 percent), Hepatitis A 269(1.01percent), and enteric fever 1489(5.61percent). During the field survey (July-August 2014) 550 cases were recorded from the selected sample sites. Where in total Acute Diarrheal cases were found 24.36 percent, Hepatitis A (10.91 percent), Enteric fever (8.36percent) while as others (56.36 percent) which include Dermatitis, Conjunctivitis, Irritated bowl and Gastro intestinal problems. The impact of waterborne diseases on the economy of the people in the study area was measured by taking into consideration no. of working days lost annually. In the study it was found that 8.89 percent of average working days are lost annually in all income groups of the total households from the sample sites due to waterborne diseases which results in an average loss of 7169.41 rupees in overall income groups per year and total economic burden of 3584706.39 rupees from all the income groups and 7.72 Percent loss of annual economic in all income groups. While as average health care expenditure in order to cope waterborne diseases in all income groups was 259559 rupees annually.

Suggestions

- So it is important that government's first and top most priority must be to provide safe and potable drinking water in the whole area so that the burden can be eliminated from the root.

- Mass awareness programmes regarding the benefits of having clean environment, safe drinking water for maintaining good and healthy life needs to be organized at panchayat level in the study area.

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