HOUSEHOLD ENVIRONMENT AND ITS LINKAGE WITH INCIDENCE OF ILLNESS IN INDIA, AS EVIDENCED FROM NATIONAL SAMPLE SURVEY

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ABSTRACT

An attempt is made to analyse the incidence of some specific types of illness in the study states and tries to investigate the association between incidence of illness and environment of the households.

Data were drawn from 69th round of NSS conducted in 2012. Information on types of illness included in the survey was stomach problem, malaria, skin disease and fever due to disease other than malaria. The present study focused on five states of India and the total number of households covered in these states was 36,433.

Among the households in the study states, 'fever due to disease other than malaria' was more widespread illness (41.8percent) followed by 'stomach problem' (26.6percent). UP and Bihar reported a higher incidence of fever (51.2 and 47.7percent respectively). Among the study states, 56.7percent of the households reported any one type of illness during the last 30 days. Incidence of any one type of illness was high among rural households (68.2percent), Muslim families (60.8percent), illiterates (61.3percent), and low UMPCE quintile households (68.0percent). With respect to household environment, households which using improved source of drinking water (pipe), practice of water treatment, hygienic method of water taken from container, using of improved sources of latrine/drainage system and household had proper drainage of waste water were less likely suffered with any one type of illness. Logistic regression analysis shows that almost in each of the variables the odds decrease with categories of a variable when compared to respective variable's first category,

indicating a decreasing chance for experiencing any one illness when improving the household environment conditions.

It can be concluded that in the states studied households are facing a number of illnesses. Hence it is recommended that government should provide safe drinking water and good sanitation for the overall quality of life of the population in these major states.

Key words: safe drinking water, sanitation, illness

INTRODUCTION

Housing is one of the traditional areas of concern for public health, though it has been relatively neglected over recent decades. But housing is important for many aspects of healthy living and well-being. Home is important for psychosocial reasons as well as its protection against the elements, but it can also be the source of a wide range of hazards (physical, chemical, biological). It is the environment in which most people spend the majority of their time. Hence, home is the 'health setting' for most, if not, all of life.

Access to safe drinking water and sanitation is not only an important measure of the socio-economic status of the household but also fundamental to the health of its members (WHO and UNICEF, 2004). The quality of life of each individual in a family is ensured by providing the safe drinking water and good sanitation. One of the United Nation's Millennium Development Goals is to have by 2015 the proportion of the population without sustainable access to safe drinking water and basic sanitation. However, despite progress, 2.5 billion people in developing countries still lack access to improved sanitation facilities (UN, 2015).

WHO estimates that 50 percent of malnutrition is associated with repeated diarrhoea or intestinal worm infections from unsafe water or poor sanitation or hygiene (WHO, 2008). Facts and figures of Census of India (2011) shows that still around 70 percent of India's rural and slum population (650 million) are exposed to water-borne and vector-borne diseases due to lack of basic sanitation facility, unsafe water and unhygienic conditions. Improved sanitation alone could reduce diarrhoea-related morbidity by more than a third, improved sanitation

combined with hygiene awareness and behaviours could reduce it by two thirds (Cairncross and Vivian (2006). Such behaviours include consistent use of a toilet or latrine by each person in the household, safe disposal of young children's faeces, and hand washing with soap or ash after defecation and before eating. Despite massive outlays for drinking water and sanitation in India, access to safe drinking water remains a challenge. Institutional challenges in rural and urban drinking water and sanitation remain a major hurdle. Under this backdrop, here an attempt is made to investigate the linkage between household environment and incidence of illness. In this study the analysis of household environment includes the quality of water, improved source, water treatment, way the water taken from container latrine type, drainage system and disposal of HH waste water. The objectives of the paper are

to study the socio-economic and background characteristics of the study population

to understand the housing conditions such as quality of water, source of drinking water, water treatment, drainage system in the households and disposal of waste water in the households.

to investigate the association between incidence of illness and environment in the households and

to examine the influence of socio-economic and housing conditions of the families on the prevalence of illness

DATA SOURCE

Data were drawn from the 69th round of the National Sample Survey (NSS). The National Sample Survey Office (NSSO) conducted a nation-wide survey on 'Drinking water, Sanitation, Hygiene and Housing Condition' in its 69th round (July 2012-December 2012) of operations. The objective of the survey was to examine and study different aspects of living conditions necessary for decent and healthy living of the household members by developing suitable indicators based upon collected information. In respect to information on types of illness, the survey focused some specific illness such as stomach problem, malaria, skin disease and fever due to disease other than

malaria. Illness was recorded if the onset of the illness was prior to the last 30 days but it continued for some time during the reference period, or if the onset of the illness was on any day during the last 30 days. The 69th round of NSS covered the whole of the Indian Union, however here an attempt is made to analysis only five major states. The reasons for focusing only on five states are that these states had major share of total India's population, it reflects the country's situation, besides, the incidence of any one specific types of illness among the family members quite high among in these states. The households covered in these states were UP with 11,563, Bihar 4,380, WB 7,280, MP 5,384 and Maharashtra with 7,818 households. Besides as major states, these states were stood at top five states in respect to high incidence of any one specific types of illness among any of the family members. Hence the present study focused on five major states of India, the total number of households covered in these states was 36,433.

RESULTS

Table 1 shows the percentage distribution of households who reported any one type of illness among any of the family members in last 30 days in the study states. It is noticed from table that among the households in the study states, 'fever due to disease other than malaria' was more widespread illness (41.8 percent) followed by 'stomach problem' (26.6percent).

Table No. 1

Percentage distribution of Households reporting Specific type of illness in study states

Specific type of illness	States					
	UP	**BIHAR**	**WB**	**MP**	**MAHA**	**Total**
Stomach problems*** 1532.517	34.0 (3929)	39.4 (1723)	24.0 (1751)	24.6 (1324)	12.4 (969)	26.6 (9696)
Malaria** 1055.354	9.1 (1047)	3.7 (164)	0.8 (61)	12.8 (687)	3.7 (289)	6.2 (2248)
Skin problems*** 482.923	12.0 (1386)	10.7 (470)	10.1 (736)	8.5 (457)	3.1 (244)	9.0 (3293)

Fever***985.008	51.2 (5914)	47.7 (2086)	35.9 (2615)	40.6 (2186)	30.7 (2402)	41.8 (15206)
Any one problems*** 1909.057	67.9 (7839)	67.4 (2949)	49.6 (3611)	58.7 (3158)	39.3 (3076)	56.7 (20633)
Total	11547	4377	7282	5384	7818	36433

***Refers to significant at 1% level (chi-square results specific illness and different states)

Prevalence of 'malaria' and 'skin disease' was 6.2 percent and 9.0 percent respectively. While analysing the incidence of 'fever due to disease other than malaria' by states, UP stood at top with 51.2 percent, followed by Bihar (47.7percent). A significant proportion of the households, in the remaining study states also reported 'fever' as the most common illness (MP: 40.6percent; WB: 35.9percent and Maharashtra: 30.7percent). In respect to occurrence of Skin diseases, UP reported a higher proportion (12.0percent) than the rest of study states. MP occupied the top position in respect to incidence of malaria during the reference period (12.8percent), followed by UP with 9.1 percent. Bihar ranked top with 'Stomach problems' among the study states (39.4percent). It can be concluded from the analysis that the incidence of specific illness is differed among the study states, each state prone to one specific illness.

While calculating any one type of illness, more than half of the households (56.7percent) in the study states reported that they experienced any one type of illness during the last 30 days among any of the family members. Data on incidence of any one type of illness by each state (figure 1) reveals that the households in UP and Bihar states reported the highest prevalence of any one type of illness (67.9 and 67.4 percent respectively) and WB with lowest prevalence (49.6percent). The incidence of any one type of illness analysis discloses that irrespective of states, more than half of the families reported any one type of illness among any one family member during the reference period.

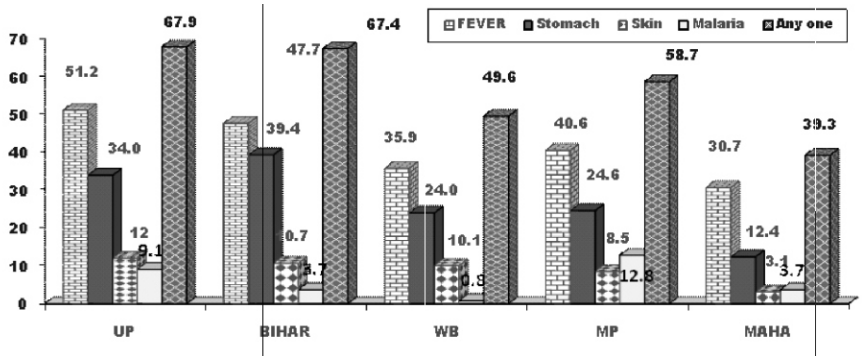

Figure No. 1

Percentage distribution of Households reporting Specific type of illness in study states

Table 2 shows that the percentage distribution of households who reported any one type of illness among any of the family members in last 30 days in the study states according to their socio-economic and demographic characteristics.

The proportion of households who reported any one type of illness was higher among rural families than urban families. The proportion of households who experienced any one type of illness was higher among rural families (62.8percent) than the urban families (48.1percent) in the study states. About seventy percent of the families who had above 6 members in their families reported any one type of illness and this proportion were 48.3percent among small families (families with up to 4 members). It is inferred that the proportion of incidence of any one illness increases in accordance with increase in household size.

Religious composition analysis shows that about three-fifth of the Muslim families suffered any one type of illness and this proportion was more than fifty percent among the Hindu families in the study states (56.3percent). Christian families were least reported than the counterparts among the study states (36.6percent). It can be concluded that the Muslims were more likely suffered and Christians were less likely suffered by any one type of illness in the study states.

Table No. 2

Percentage distribution of Households reported with incidence of any one type of illness by Background conditions

SED Characteristics	% of Incidence of any one specific type of illness
Place* 770.720**	
Rural	62.8 (13340))
Urban	48.1 (7293)
Household Size* 1062.862**	
Up to 4 members	48.3 (8419)
5-6 members	61.1 (7066)
Above 6 members	69.2 (5148)
Religion* 134.081**	
Hindu	56.3 (16621)
Muslim	60.8 (3633)
Christian	36.6 (53)
Others	42.0 (325)
Caste* 555.974**	
ST/SC	59.4 (6121)
OBC	61.9 (8813)
Others	48.0 (5699)
Male edn level* 615.086**	
No education	61.3 (2705)
Below Primary	66.1 (1709)
Primary	62.7 (3006)
Secondary	58.9 (7579)
Hr. Secondary	53.0 (2724)
Degree	43.8 (2319)
Occupation Rural*61.386**	
Agri related activities	63.0 (7932)
Non- agri	65.2 (3883)

Salary/regular wage	56.3 (889)
Others	56.5 (628)
Occupation Urban*191.899**	
Self employed	51.4 (3171)
Salary/regular wages	44.2 (2231)
Casual labour	55.2 (1358)
Others	36.1 (530)
UMPCE (Rs) Rural* 257.537**	
1 (>800)	68.0 (5600)
2 (801-1000)	63.6 (3189)
3 (1001-1264)	60.3 (2109)
4 (1265-1667)	55.8 (1412)
5 (Above 1667)	52.0 (1029)
UMPCE (Rs) Urban* 687.287**	
1 (>1182)	58.9 (3641)
2 (1182-1600)	50.3 (931)
3 (1601-2200)	47.2 (855)
4 (2201-3200)	40.0 (867)
5 (Above 3200)	31.7 (997)

***Refers to significant at 1% level (chi-square results any one illness and SED conditions)

A higher proportion of OBC category families suffered any one type of illness (61.9percent) than the counterparts. The proportion of families who experienced any one type of illness was more among the male illiterate households than the families with degree completed (61.3 and 43.8percent respectively). It is also observed that more than three-fifth of rural households who engaged in agricultural sector experienced any one type of illness (63.0percent), whereas this proportion for rural households depend on salary/regular wages was 56.5percent. On contrast, the urban households who depend on salary/regular wages were slightly better than the rural households who depend on

salary/regular wages (44.2percent). The proportion of urban households in the high UMPCE quintile was less likely to experience any one type of illness (31.7percent) than households who in low UMPCE quintile (58.9percent). A similar pattern was noticed among the rural households however the difference between low UMPCE quintile and high UMPCE quintile was 4 points.

Household environment and incidence of any one type of illness:

An attempt is made in this section to examine the linkage between household environment and prevalence of any one type of illness among any of the family members in last 30 days in the study states. Table 3 shows that the percentage distribution of households who reported any one type of illness in the study states according to their household environment conditions.

Improved sources of Drinking water and incidence of any one type of illness

Sources of drinking water are classified into two types, sources of drinking water through pipe supply (bottled water, piped water into dwelling, piped water to yard/plot, public tap/standpipe) and other than pipe supply sources (tube well/borehole, protected and unprotected well, protected and unprotected spring, rainwater collection, surface water: tank/pond, other surface water: river, dam, stream, canal, lake, etc. others: tanker-truck, cart with small tank or drum, etc). The linkage between sources of drinking water and incidence of any one type of illness clearly reveals that more than three-fifth of the households who depend on 'other than pipe' as sources of drinking water suffered by any one type of illness in the study states (62.8percent) and this proportion was less among household supplied drinking water through pipe (44.7percent). It can be concluded that the families who get drinking water through pipe are better in health than their counterpart.

Quality of Drinking water and prevalence of any one type of illness:

Information on households' perception on the quality of drinking water they received from the principal source was collected during the 69th

NSS round. It was ascertained whether the water was 'bad in taste', 'bad in smell', 'bad in taste and smell', 'bad due to other reasons' or had 'no defect'. The proportion of households reporting 'no defect' of drinking water from respective principal source can be interpreted as the proportion of households that were satisfied with the quality of the drinking water they got. Data on quality of drinking water discloses that nearly two-third of the families who perceived the drinking water as defected was suffered with any one of the illness during the reference period and this proportion for 'no defect' water was 55.6 percent.

Table No. 3

Percentage distribution of households who reported any one type of illness according to their household environment conditions

Household Environments	Incidence of any one illness
Improved source* 1092.880**	
Piped water	44.7 (5492)
Other than pipe	62.8 (15138)
Quality of water* 129.805**	
Water with defect	65.0 (2658)
Water with no defect	55.6 (17970)
Water treatment * 825.054	
Treated by any method	45.6 (5160)
Not treated	61.7 (15468)
Way the water taken from container* 165.884**	
Hygienic method	49.2 (3963)
Non-hygienic method	57.4 (14043)
Latrine Type* 38.813**	
Improved sources	48.9 (9051)
Unimproved sources	62.0 (243)

Not used	62.9 (107)
Drainage system*215.667**	
Improved drainage system	52.1 (5088)
No improved system	60.3 (15538)
Disposal of HH waste water* 407.456**	
Drainage/safe-reuse	50.4 (7494)
Open space	61.0 (13130)

***Refers to significant at 1% level (chi-square results anyone illness and HH environments)

Treatment of drinking water and occurrence of any one type of illness: The treatment of drinking water is an important determinant of quality of drinking water and hygienic living, as many households treat water by one or more methods before drinking. Treatment of water can be done through boiling, filtering, by using chemicals, by using electronic purifier or by any other method. The households who treated the water by one or more methods before drinking were less likely suffered by any one type of illness than the households who had not treated water before use (45.6 and 61.7percent respectively).

Method of taking out the drinking water from storage container and prevalence of any one type of illness: Household's hygienic status related to drinking water is determined by the way the drinking water taking out from the storage container. In NSS 69th round, for the households that stored drinking water, how drinking water was taken out from the main container was recorded using four codes viz. through tap, vessel with handle dipped in to take out water, vessel without handle dipped in to take out water and poured out. In this analysis, through tap and poured out are considered as hygienic method of taking out the drinking water from the storage container. The other methods are considered as non-hygienic method. More than half of the households (57.4percent) who had the practice of non-hygienic way of taking out the drinking water were suffered with any one type of illness and this proportion for hygienic way of taking out was 49.2 percent.

Latrine facilities and occurrence of any one type of illness: The households have access to latrine facilities are classified as improved type of latrine and unimproved type of latrine. The improved type of latrine includes sources such as flush/pour flush to piped sewer system/septic tank, pit latrine, ventilated improved pit latrine, pit latrine with slab and composting toilet. It is noticed from the table that the families who used improved types of latrine were less likely to suffer any one type of illness (48.9percent) than their counterparts.

Drainage system and occurrence of any one type of illness: Proper drainage arrangement ensures easy carrying-off waste water and liquid waste of the house without any overflow or seepage. The survey obtained information on whether a drainage system for the household was present and if so, identified its nature underground, covered pucca, open pucca or open kachha. The households which have improved drainage system (underground, covered pucca, open pucca) were less likely suffered by any one type of illness (52.1percent) than the household had unimproved drainage system (60.3percent). Besides the drainage system in the household, information was also collected on disposal of waste water and whether the waste water put to safe re-use after treatment or places where it was disposed off without treatment. Data evident that the households which disposed the household waste water open spaces were more suffered by any one type of illness than the rest (61.0 and 50.4percent respectively).

The **influences of socio-economic and household environment variables in determining the prevalence of any one of the illness** are examined by logistic regression among the study states. The logistic regression analysis results table 4 shows that almost in each of the variables the odds decrease with the categories of a variable when compared to the respective variable's first category, indicating a decreasing chance for experiencing any one of illness when improving the household environment conditions (except educational level of Male, Latrine Type, Drainage system and Disposal of HH waste water). In this model, religion, caste, UMPCE (urban), improved source of drinking water, Quality of water, Water treatment and Way the water taken from container are found to be highly significant risk factors of any one type of illness.

The regression table reveals that there is a significant relationship between religion and prevalence of illness in the study states. The Muslim families have a significantly higher probability of being illness. It is found that Muslim families have a 1.358 (95% CI: 1.220 to 1.510; p< 0.000) higher chance of being seen as illness than Hindus. The results revealed that as compared with ST/SC families, OBC families and Other category families are less likely to be suffered by any one illness (OR= 0.945 and OR=0.791 respectively). However, the educational achievement failed to show a significant association with the prevalence of any one type of illness. As compared with urban households in the low UMPCE quintile, households residing with high UMPCE are less likely to be suffered by illness (OR=0.498).

Table No. 4

Odds ratios from logistic regression examining the effect of selected SED and household environment variables on illness condition in major states

SED and Housing Environments	B	S.E.	Sig.	Exp(B)	95.0% C.I.for EXP(B)	
					Lower	Upper
Religion* **						
Hindu(R)			.000	1.000		
Muslim	.306	.054	.000	1.358	1.220	1.510
Christian	-.397	.234	.090	.672	.425	1.064
Others-.	162	.112	.146	.850	.683	1.058
Caste* **						
ST/SC (R)		.000	1.000			
OBC	-.056	.059	.344	.945	.842	1.062
Others	-.235	.057	.000	.791	.707	.884
Male edn level						
No education (R)			.091	1.000		
Below Primary	.207	.136	.126	1.230	.943	1.605
Primary	-.041	.117	.726	.960	.763	1.207
Secondary	.073	.105	.484	1.076	.877	1.321

Hr. Secondary	.052	.111	.637	1.054	.848	1.308
Degree	-.038	.110	.731	.963	.776	1.195
UMPCE Urban* **						
1 (>1182) (R)		.000	1.000			
2 (1182-1600)	-.287	.064	.000	.750	.662	.851
3 (1601-2200)	-.301	.064	.000	.740	.652	.839
4 (2201-3200)	-.481	.063	.000	.618	.547	.699
5 (Above 3200)	-.698	.064	.000	.498	.439	.564
Improved source* **						
Piped water (R)				1.000		
Other than pipe	.217	.044	.000	1.242	1.140	1.353
Quality of water* **						
Defect water (R)				1.000		
No defect water	-.545	.061	.000	.580	.515	.654
Water treatment * **						
Treated (R)			1.000			
Not treated	.147	.043	.001	1.158	1.065	1.260
Way the water taken from container* **						
Hygienic method (R)				1.000		
Non-hygienic method	.162	.043	.000	1.176	1.080	1.280
Latrine Type [NS]						
Improved Types (R)			.376	1.000		
Unimproved Types	-.020	.162	.901	.980	.713	1.347
Not used	.811	.583	.164	2.251	.718	7.056
Drainage system [NS]						
Improved drainage (R)				1.000		
No improved system	-.030	.066	.647	.970	.853	1.104
Disposal of HH waste water [NS]						
Drainage/safe-reuse (R)				1.000		
Open space	.070	.063	.264	1.072	.949	1.213
Constant	.408	.131	.002	1.504		
-2 Log likelihood	14924.035(a)					

*** Significant at 0.001, NS = not significant, (Ref.) indicates the reference category of the variable

The regression table reveals that drinking water supplied through other than pipe sources to the households have significantly higher probability of being suffered by any one illness as compared with households supplied drinking water by pipe (OR=1.242). There is a significant association between treatment of drinking water before use and prevalence of any one illness that as compared with households who practiced the treatment of drinking water, the probability of being suffered is higher among households using non treatment of drinking water (1.158). It can be inferred from table 5 that the logistic regression analysis identified the most important explanatory variables of illness status in major states. In this model, religion, caste, UMPCE (urban), improved source of drinking water, quality of water, water treatment and way the water taken from container are found to be determinants of household morbidity.

Conclusion: It can be concluded that the households in the study states are facing higher degree of illness. It is also inferred from the study that the fever due to disease other than malaria and stomach problem are comparatively higher in study states. The logistic regression clearly evident those household environments have a significant influence on the odds of any one type of illness in the study states. Hence it is recommended that government should ensure to provide safe drinking water and good sanitation for the overall quality of life of the population in these major states.

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Annexure

Operational definition of the variables used in this paper

Principal source of drinking water:

In 69th round of NSS, the principal sources of drinking water were classified as follows: bottled water, piped water into dwelling, piped water to yard/plot, public tap/standpipe, tube well/borehole, well: protected, unprotected, spring: protected, unprotected; rainwater collection, surface water: tank/pond, other surface water (river, dam, stream, canal, lake, etc.), others (tanker-truck, cart with small tank or drum, etc).

Improved source

In this paper , Sources of drinking water has classified into two types, supply of drinking water through pipe which includes bottled water,

piped water into dwelling, piped water to yard/plot, public tap/standpipe and supply of drinking water **o**ther than pipe supply sources which comprises the tube well/borehole, protected and unprotected well, protected and unprotected spring, rainwater collection, surface water: tank/pond, other surface water: river, dam, stream, canal, lake, etc. others: tanker-truck, cart with small tank or drum, etc.

Treated Water

Treated Water means the drinking water was treated through boiling, filtering, by using chemicals, by using electronic purifier or by any other method before using it

Drinking Water taken from container by Hygienic/Non-hygienic method

If the stored water in the households were taken out through tap and poured out from container were considered as hygienic method of handling the drinking water. Non-hygienic method includes the vessel with handle dipped in to take out water and vessel without handle dipped in to take out water.

Latrine Type

Improved type of Latrine: It comprises the flush/pour flush to piped sewer system/septic tank method, pit latrine method, ventilated improved pit latrine type, pit latrine with slab and composting toilet type. All other types were considered as unimproved types

Drainage system

Improved system of drainage includes the system of underground, covered pucca, open pucca

Disposal of HH waste water

The method of disposing households' waste water is classified into two types: Drainage/safe-reuse: It includes the drainage system and safe re-use after treatment of households' waste water

Open space: It includes the disposal of waste water without treatment to open low land areas, ponds, nearby river, and disposed off with or without treatment to other places.