



RESEARCH ARTICLE

PREVALENCE AND DETERMINANTS OF MORBIDITY AMONG CHILDREN UNDER AGE OF FIVE YEARS: A CROSS SECTIONAL STUDY FROM SUB HIMALAYAN REGION

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ABSTRACT

Background: The silent emergency of child under-nutrition is an internationally recognized public health problem. The vicious cycle of social deprivation leading to nutritional deprivation further leading to economic and social deprivation continues in our country.

Objective: This present study focuses on water, hygiene, feeding habits and socio cultural factors in relation to morbidity among children less than five years of age of District Kangra in Himachal Pradesh, India.

Methodology: A community based cross-sectional study on 2400 children of age less than and equal to 59 months was conducted. Morbidity profile and socio demographic indicators along with other variables were conducted in form of interview. The study was conducted using 30 cluster technique with 80 participants from each cluster of district Kangra.

Results: Around 40% of children suffered any type of illness in last two weeks. Females suffered a higher proportion of illness (40.5%). Overall 43.9% using water filter reported illnesses in last two weeks followed by plastic bucket with cover (41.1%). Only 1% of households boiled water for purification. Overall daily bathing emerged as a protective factor from illnesses (OR: 0.79; 95%CI (0.64-0.98)). It was observed that as reported intake of regular fruit, green vegetables, biscuits, cerelac and packaged fruit juices were associated with increased risk of illness in last two weeks.

Conclusion: Socio economic status and area of residence are directly or indirectly linked to Safe Water access, sanitation practices, feeding habits and socio cultural practices of a family. All the above in turn affect health of a child. Hence all the interlinked practices need to be emphasized upon.

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INTRODUCTION

Ever since the introduction of Alma Ata declaration to achieve "Health for All by 2000", a lot of planning effort and public expenditure had been devoted to improve health in India. Children are the backbone of any country and their health is prime concern of any country. The age group of less than five years is very crucial because it is the transitional period when the child is struggling to come into equilibrium with its ecology. During this period about 40% of physical growth and 80% of mental development occurs. (Joshi, 1996) Child morbidity is not a single problem with a single solution. Multiple and interrelated determinants interact demanding chain of approaches and policies to be evolved to deal with

such kind of health hazard. (Elizabeth and Raj Sherin, 2012) Socio economic statuses are related to morbidity among children in developed and developing world both. (Vyas et al., 2014) A significant proportion of deaths can be prevented through safe drinking water, adequate sanitation, hygiene, immunization, proper infant feeding and enabling environments. Evidence indicates that poor water, sanitation, and hygiene (WASH) increase risk of infection influence growth. Sanitation and hygiene interventions are estimated to generate a 36 % and 48 % reduction in diarrheal risk in young children, respectively. (Kirik et al., 2017) Prevalence, severity and frequency of morbidity due to infections depend upon infant and young child feeding and caring practices and nutritional status of the child. A number of studies in developing countries have demonstrated a protective effect of early initiation and exclusive breastfeeding against diarrhea. (Acharya et al., 2017) Traditional feeding practices are those

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practices that are directly related to the nutritional and dietary aspects of feeding. As observed in all cultures, each society has its peculiar way of dealing with bio-cultural problems affecting its human population. Response to various interventions seems to differ considering the peculiar knowledge displayed by the population in each society. (Akpenpuun, 2013) This present study focuses on water, hygiene, feeding habits and socio cultural factors in relation to morbidity among children less than five years of age of District Kangra in Himachal Pradesh, India.

MATERIALS AND METHODS

Study Area

This study was carried out in urban, rural and slum population of district Kangra, located in the state Himachal Pradesh. The majority of population of district (94.3%) resided in rural areas. For the purpose of study, nine towns of district Kangra having 68 wards, with population of 86,281 along with its slum population were included as urban and urban slum population, while rest of the district Kangra, with a population of 14, 23,794 were taken as rural and rural slum population. (<http://www.census2011.co.in/census/district/230-kangra.html>)

Study Design

A community based cross-sectional study.

Study Population

The study population included children in the age group of 0 to 59 completed months of age from the selected areas. The age of the study participants who were less than one month was taken as completed days of life and those who were more than one month were taken as completed months of age on the day of examination. As study population was distributed among Rural and Urban population, to measure socio-economic status for rural participants Uday Parekh scale and modified Kuppuswamy scale in the urban population were used. (Parikh and Trivedi, 1964; Sharma, 2015)

Study Period

The study was carried out for a period of one year from April 2014 through March 2015.

Sample size

Estimated population of children less than five years in district Kangra is about 1, 20, 000. Taking margin of error 2%, confidence level 95% and 50% response distribution, minimum sample size was calculated to be 2354 which was round figured for continece to 2400. The study population of 2400 was divided in a proportion of 90% and 10% between rural and urban areas respectively in accordance with the demographic distribution prevalent in Himachal Pradesh hence we recruited 2160 from rural areas and 240 from urban. (<http://www.census2011.co.in/census/district/230-kangra.html>)

Study tool

A semi structured questionnaire which included demographic profile, socio economic status of the family using Uday

Pareek Scale for rural area and Modified Kuppuswamy scale, for urban area along with socio-cultural, personal hygiene, drinking water along with eating habits of the participants.

Ethical Justification

The ethical approval for the initiation of the study was sought by Institutional Ethics Committee of Dr. Rajendra Prasad Government Medical College, Kangra at Tanda (H.P.).

Sampling technique

In the study 30 Cluster sampling technique, by World Health Organization for immunization surveillance was used.⁹ The study participants from rural areas (2400) were distributed among 30 clusters, which come out to 80 participants per cluster. District Kangra's population is catered by 440 Health Sub Centres (Kirik *et al.*, 2017) and each sub centre was considered as cluster or primary sampling unit and children from 0 to 59 months of age was secondary sampling unit. For the recruitment of study population sampling was done in the two phases.

Phase I

In first phase, 440 Health sub centres were divided into 331 rural and nine urban Health centres. Rural and urban Health Centres were arranged alphabetically and a numerical number was allocated to each health sub centre of rural and urban area. Among these health sub centres 27 serving rural population and three serving urban were selected randomly by using online software for randomization. The Chief Medical officer of District Kangra was briefed about the study and prior permission was sought. The respective Block Medical Officers of the blocks in which the sub centres were located were informed and due permission was sought to carry out the study.

Phase II

The clusters were mapped and first cluster was picked up randomly by using the lottery method. Before the conduction of study a meeting was held with the health sub centre in charge for obtaining required information about the number of villages/ wards served, number of households in these villages/ wards and the total number of eligible participants. To mark the starting point of the survey an empty bottle was twisted in the courtyard of Health Sub centre. First house in the direction pointed by the bottle was marked as first starting point of that cluster and the subsequent adjacent houses were visited till the required sample size of 80 participants was completed in that cluster. Respondent (mother or care taker of child) was explained about the purpose of study and an informed consent from either parents or legal guardian any adult of household of age more than 18 years of age was sought. If any child was found absent at the time of first visit, that house was visited twice again. During third visit if child is found absent, he or she was excluded from the study and next eligible study participant from other household in the same cluster was included in the study to complete the sample size of 80 in that cluster. Similar procedure was adopted in the remaining 29 clusters. The questions pertaining to socio demography and practices and morbidity among study participants were asked by the interviewer in the language spoken by the natives.

Variables

A symptom due to any type of illness in last two weeks prior to the day of interview was taken as dependent variable. It included predominantly acute illnesses like diarrhea, fever, vomiting, running nose, sore throat, common cold, sign and symptom of acute respiratory infection and skin infections. Socio demographic variables, drinking water source, storage and purification were taken as independent variables. Also feeding habits which included, exclusive breast feed, cow milk as feed on regular basis, use of fruits and vegetables on regular basis, cow milk, biscuits, cerelac, egg and non vegetarian food were included as independent variables. Socio cultural practices as independent variable were use of massage, oil, sacred thread, band and clothes to prevent child from illness.

Data and Statistical Analysis

Data collected on the variables such as age, gender, and socioeconomic status along with other independent variables was summarised as proportions was compared using chi square test. Bivariate analysis was presented using independent and dependent variables. Level of significance was set at the level of 5%.

RESULTS

Socio demographic profile

The study respondents of study participants were asked about any illness suffered by child in last two weeks. Around 40% of children suffered any type of illness in last two weeks. Females suffered a higher proportion of illness (40.5%) as compared to males (39.7%). Highest proportion of children between one to three years suffered illness (42.3%) followed by 3-5 years old (39.4%) and this distribution was statistically significant ($p:0.02$). Majority of participants were from rural areas hence majority of them suffered the illnesses from rural area (40.8%). Lower the socio economic status higher the proportion of those who suffered illnesses and this distribution was statistically significant in slums ($p: 0.01$). More than one third children were born low birth weight (33.3%) and there was no significant difference between low birth and normal birth weight children in context to illness. (Table 1) Majority of the study participants were suffering from respiratory tract infections (61.4%). Those having fever constituted 45.8 %. Diarrhoea was reported among 9 % and vomiting was reported by 3.5 % of the participants. Skin infections were also reported in 6.7 % of the participants.

Drinking water source, storage and purification measures

The respondents of children reported that in 58.8 % of households drinking water was fetched from tap water supply, 9.8 % from *baudi* and 2.2% still use well. Majority of illnesses occurred among those consuming water from *baudi* in rural area (41.9%), hand pump from urban area (39.1%) and slum area (66.7%). (Table 2) Those using water filters in rural areas (46.7%), steel bucket with cover in urban area (50%) and metal pot with cover in slums (66.7%) reported a higher proportion of illnesses. However, the distributions were statistically non significant. Overall 43.9% using water filter reported illnesses in last two weeks followed by plastic bucket with cover (41.1%). (Table 2) Those reporting purification measure as 'letting the water stand still' before use also reported 60% of

illnesses among their children. Use of electronic water filter in households reported 40.1% illness and those who did nothing to purify water reported 39.9% illness among their children. Among respondents of rural area those who boiled water before usage reported the proportion of those who suffered illnesses were 36.4% and among those letting the water stand still before use 63% of children were ill in last two weeks. This distribution was statistically significant ($p: 0.03$). (Table 2)

Personal hygiene and sanitation

The respondents were asked about the personal hygiene and sanitation of their children. (Table 3) It was observed that in rural area those children who did not take bath daily suffered 47.1% of illnesses in last two weeks in comparison to 39.6% who took bath daily and this distribution was statistically significant ($p:0.01$). Similar distribution was observed among urban and slum children. Overall daily bathing emerged as a protective factor from illnesses (OR: 0.79; 95%CI (0.64-0.98)). There was no significant difference in illness among children who changed the clothes daily or not (OR: 0.98; 95% CI (0.69-1.39)). In rural areas among those who did not change their clothes daily 46.4% suffered from illness in last two weeks as compared to 40.6% who changed their dress daily, however, this difference was statistically not significant ($p:0.29$). All the respondents in our study reported that they and their children washed their hands before eating. (Table 3)

Feeding habits of children

The respondents were asked about eating habits of children and their relation with morbidity has been presented in table 4. Exclusive breast feeding (EBF) was prevalent among 51.1% but there was no significant association between EBF and illness (OR: 0.97; 95% CI:0.83-1.15). More than half (57.4%) of those who consumed fruits daily did not suffer from any type of illness in last two weeks, however among those who did not consume fruit daily also reported 72.5% cases with no illness (OR: 1.94; 95%CI (1.52-2.48)). Overall cow's milk consumption was positively associated with illnesses (OR: 1.66; 95%CI (1.32-2.09)). Consumption of packed juices was also positively associated with risk of illness (OR: 1.32; 95%CI: 1.10-1.56). Biscuit (OR: 1.41; 95% CI: 1.15-1.73) and *Cerelac* (OR: 1.46; 95%CI: 1.21-1.75) intake by children were also positively and significantly associated with illness. Adding ghee and butter to the food of child was not associated with illnesses in last two weeks. Around 60.5% and 61.2% of those consuming egg did not cater to any illness in last two weeks. Those who responded as taking green vegetables regularly were twice at risk of illness (OR: 2.10; 95%CI (1.62-2.73)). There was no significant association between intake of fresh food and risk of illness (OR: 1.32; 95% CI: 0.94-1.86). (Table 4)

Socio cultural practices

The socio cultural practices prevalent in relation to children and their health were interviewed by the respondent. Massaging a child by his/her guardians regularly was not associated with prevention of illness in last two weeks (OR: 1.07; 95% CI: 0.90-1.26). Similarly tying a sacred thread (OR: 1.17; 95% CI: 0.99-1.26), band (OR: 1.39; 95%CI: 0.65-2.98), cloth (OR: 0.75; 95% CI: 0.25-2.19) and wearing a *tavez* (OR: 1.00; 95% CI: 0.80-1.26) were not associated with prevention of illnesses.

Table 1. Socio demographic profile of study participants in relation to morbidity

Socio demographic characters		Any illness in last two weeks		Total	P value
		Yes	No		
Total		962	1438	2400	
Sex	Male	40.1%	59.9%	100.0%	0.68
	Female	495	753	1248	
Age in months	<1	39.7%	60.3%	100.0%	0.02
	1 to < 12	467	685	1152	
	12 to < 36	40.5%	59.5%	100.0%	
	36 to < 60	13	43	56	
	Total	23.2%	76.8%	100.0%	
Residence	Rural	222	353	575	0.12
	Urban	38.6%	61.4%	100.0%	
	Slum	436	594	1030	
SES (rural)	Lower middle class	42.3%	57.7%	100.0%	0.10
	Middle Class	291	448	739	
	Upper Middle Class	39.4%	60.6%	100.0%	
	Upper Class	868	1258	2126	
	Total	40.8%	59.2%	100.0%	
	Total	868	1258	2126	
SES (urban)	Lower class	8	7	15	0.59
	Lower middle class	53.3%	46.7%	100.0%	
	Middle Class	335	444	779	
	Upper Middle Class	43.0%	57.0%	100.0%	
	Upper Class	520	790	1310	
	Total	39.7%	60.3%	100.0%	
SES (slum)	Lower class	5	17	22	0.01
	Lower middle class	22.7%	77.3%	100.0%	
	Middle Class	9	15	24	
	Upper Middle Class	37.5%	62.5%	100.0%	
	Total	0	2	2	
	Total	0.0%	100.0%	100.0%	
Low birth weight	Yes	76	145	221	0.86
	No	34.4%	65.6%	100.0%	
	Total	4	0	4	
Total	Lower Middle class	100.0%	0.0%	100.0%	0.01
	Middle class	9	24	33	
	Total	27.3%	72.7%	100.0%	
Total	Yes	5	11	16	0.86
	No	31.3%	68.8%	100.0%	
	Total	18	35	53	
Total	Yes	34.0%	66.0%	100.0%	0.86
	No	322	476	798	
	Total	40.4%	59.6%	100%	
Total	Yes	640	962	1602	0.86
	No	40%	60%	100%	
	Total	962	1438	2400	
Total		40.1%	59.9%	100%	

Table 2. Drinking water source, storage and purification measures in relation to Morbidity suffered by children

Residence	Source of water	Any illness in last two weeks		Total	P value
		Yes	No		
Rural	Baudi	518	717	1235	0.55
	Well	41.9%	58.1%	100.0%	
	Hand pump	245	391	636	
	Tap water	38.5%	61.5%	100.0%	
	Total	13	17	30	
Urban	Baudi	43.3%	56.7%	100.0%	0.92
	Well	92	133	225	
	Hand pump	40.9%	59.1%	100.0%	
	Tap water	868	1258	2126	
	Total	40.8%	59.2%	100.0%	
Total	Baudi	47	96	143	0.92
	Well	32.9%	67.1%	100.0%	
	Total	17	30	47	
Total		36.2%	63.8%	100.0%	

	Hand pump	9	14	23	
		39.1%	60.9%	100.0%	
	Tap water	3	5	8	
		37.5%	62.5%	100.0%	
	Total	76	145	221	
		34.4%	65.6%	100.0%	
Slum	Baudi	11	22	33	0.45
		33.3%	66.7%	100.0%	
	Well	5	12	17	
		29.4%	70.6%	100.0%	
	Hand pump	2	1	3	
		66.7%	33.3%	100.0%	
	Tap water	18	35	53	
		34.0%	66.0%	100.0%	
Total	Baudi	576	835	1411	0.68
		40.8%	59.2%	100.0%	
	Well	267	433	700	
		38.1%	61.9%	100.0%	
	Hand pump	22	31	53	
		41.5%	58.5%	100.0%	
	Tap water	97	139	236	
		41.1%	58.9%	100.0%	
	Total	962	1438	2400	
		40.1%	59.9%	100.0%	
Residence	Storage of drinking water	Any illness in last two weeks		Total	P value
		Yes	No		
Rural	No Storage	15	21	36	0.15
		41.7%	58.3%	100.0%	
	Steel Bucket with cover	29	49	78	
		37.2%	62.8%	100.0%	
	Plastic Bucket with Cover	149	197	346	
		43.1%	56.9%	100.0%	
	Earthen Pot With Cover	300	495	795	
		37.7%	62.3%	100.0%	
	Metal Pot with Cover	253	357	610	
		41.5%	58.5%	100.0%	
	Water Filter	122	139	261	
		46.7%	53.3%	100.0%	
	Total	868	1258	2126	
		40.8%	59.2%	100.0%	
Urban	No Storage	1	5	6	0.58
		16.7%	83.3%	100.0%	
	Steel Bucket with cover	11	11	22	
		50.0%	50.0%	100.0%	
	Plastic Bucket with Cover	9	20	29	
		31.0%	69.0%	100.0%	
	Earthen Pot With Cover	19	35	54	
		35.2%	64.8%	100.0%	
	Metal Pot with Cover	20	37	57	
		35.1%	64.9%	100.0%	
	Water Filter	16	37	53	
		30.2%	69.8%	100.0%	
	Total	76	145	221	
		34.4%	65.6%	100.0%	
Slum	Steel Bucket with cover	1	2	3	0.58
		33.3%	66.7%	100.0%	
	Plastic Bucket with Cover	15	31	46	
		32.6%	67.4%	100.0%	
	Earthen Pot With Cover	0	1	1	
		0.0%	100.0%	100.0%	
	Metal Pot with Cover	2	1	3	
		66.7%	33.3%	100.0%	
	Total	18	35	53	
		34.0%	66.0%	100.0%	
Total	No Storage	16	26	42	0.44
		38.1%	61.9%	100.0%	
	Steel Bucket with cover	41	62	103	
		39.8%	60.2%	100.0%	
	Plastic Bucket with Cover	173	248	421	
		41.1%	58.9%	100.0%	
	Earthen Pot With Cover	319	531	850	
		37.5%	62.5%	100.0%	
	Metal Pot with Cover	275	395	670	
		41.0%	59.0%	100.0%	
	Water Filter	138	176	314	
		43.9%	56.1%	100.0%	
	Total	962	1438	2400	
		40.1%	59.9%	100.0%	
Residence	Purification of water	Any illness in last two weeks		Total	P value

Residence	Water Treatment	Any illness in last two weeks			P value
		Yes	No	Total	
Rural	Do Nothing	721	1095	1816	0.03
		39.7%	60.3%	100.0%	
	Boil	8	14	22	
		36.4%	63.6%	100.0%	
	Manual water filter	113	129	242	
		46.7%	53.3%	100.0%	
	Electronic water filter	9	10	19	
47.4%		52.6%	100.0%		
Let it stand and settle	17	10	27		
	63.0%	37.0%	100.0%		
Total	868	1258	2126		
	40.8%	59.2%	100.0%		
Urban	Do Nothing	54	103	157	0.62
		34.4%	65.6%	100.0%	
	Boil	1	1	2	
		50.0%	50.0%	100.0%	
	Manual water filter	14	31	45	
		31.1%	68.9%	100.0%	
	Electronic water filter	2	6	8	
25.0%		75.0%	100.0%		
Let it stand and settle	1	2	3		
	33.3%	66.7%	100.0%		
Use clean Utensil to store	4	2	6		
	66.7%	33.3%	100.0%		
Total	76	145	221		
	34.4%	65.6%	100.0%		
Slum	Do nothing	18	35	53	NA
		34.0%	66.0%	100.0%	
Total	Do nothing	18	35	53	
		34.0%	66.0%	100.0%	
Total	Do nothing	793	1233	2026	0.09
		39.1%	60.9%	100.0%	
	Boil	9	15	24	
		37.5%	62.5%	100.0%	
	Manual water filter	127	160	287	
		44.3%	55.7%	100.0%	
	Electronic water filter	11	16	27	
40.7%		59.3%	100.0%		
Let it stand and settle	18	12	30		
	60.0%	40.0%	100.0%		
Use clean Utensil to store	4	2	6		
	66.7%	33.3%	100.0%		
Total	962	1438	2400		
	40.1%	59.9%	100.0%		

Table 3. Personal hygiene and sanitation in relation to Morbidity

Residence	Hygiene/Sanitation	Response	Any illness in last two weeks			P value
			Yes	No	Total	
Rural	Bath Daily	Yes	700	1069	1769	0.01
			39.6%	60.4%	100.0%	
	No	168	189	357		
		47.1%	52.9%	100.0%		
Total		868	1258	2126		
		40.8%	59.2%	100.0%		
Urban	Bath Daily	Yes	69	122	191	0.22
			36.1%	63.9%	100.0%	
	No	7	23	30		
		23.3%	76.7%	100.0%		
Total		76	145	221		
		34.4%	65.6%	100.0%		
Slum	Bath Daily	Yes	6	16	22	0.56
			27.3%	72.7%	100.0%	
	No	12	19	31		
		38.7%	61.3%	100.0%		
Total		18	35	53		
		34.0%	66.0%	100.0%		
Total	Bath Daily	Yes	775	1207	1982	0.04
			39.1%	60.9%	100.0%	
	No	187	231	418		
		44.7%	55.3%	100.0%		
Total		962	1438	2400		
		40.1%	59.9%	100.0%		
Residence			Any illness in last two weeks	Total	P value	
Rural	Daily clothes Change	Yes	823	1206	2029	0.29
			40.6%	59.4%	100.0%	

		No	45	52	97	
	Total		46.4%	53.6%	100.0%	
Urban	Daily clothes Change	Yes	868	1258	2126	0.06
			40.8%	59.2%	100.0%	
			74	130	204	
		No	2	15	17	
	Total		11.8%	88.2%	100.0%	
Slum	Daily clothes Change	Yes	76	145	221	0.77
			34.4%	65.6%	100.0%	
			9	20	29	
		No	9	15	24	
	Total		31.0%	69.0%	100.0%	
			37.5%	62.5%	100.0%	
Total	Daily clothes Change	Yes	18	35	53	0.93
			34.0%	66.0%	100.0%	
			906	1356	2262	
		No	9	15	24	
	Total		40.6%	59.4%	100.0%	
			40.1%	59.9%	100.0%	
			56	82	138	
	Total		40.6%	59.4%	100.0%	
			962	1438	2400	
			40.1%	59.9%	100.0%	

Table 4. Type of food taken on routine basis and morbidity

Residence		Any illness in last two weeks		Total	P value	
		Yes	No			
Rural	Exclusive Breast feed	Yes	436	633	1069	1.00
			40.8%	59.2%	100.0%	
			No	432	625	
	Total	868	1258	2126		
Urban	Exclusive Breast feed	Yes	45	94	139	0.46
			32.4%	67.6%	100.0%	
			No	31	51	
	Total	76	145	221		
		34.4%	65.6%	100.0%		
Slums	Exclusive Breast feed	Yes	7	12	19	0.77
			36.8%	63.2%	100.0%	
			No	11	23	
	Total	18	35	53		
		34.0%	66.0%	100.0%		
Total	Exclusive Breast feed	Yes	488	739	1227	0.77
			39.8%	60.2%	100.0%	
			No	474	699	
	Total	962	1438	2400		
		40.1%	59.9%	100.0%		
Rural	Fruits	Yes	781	1049	1830	0.00
			42.7%	57.3%	100.0%	
			No	87	209	
	Total	868	1258	2126		
		40.8%	59.2%	100.0%		
Urban	Fruits	Yes	65	93	158	0.001
			41.1%	58.9%	100.0%	
			No	11	52	
	Total	76	145	221		
		34.4%	65.6%	100.0%		
Slum	Fruits	Yes	16	32	48	1.00
			33.3%	66.7%	100.0%	
			No	2	3	
	Total	18	35	53		
		34.0%	66.0%	100.0%		
Total	Fruits	Yes	862	1174	2036	0.00
			42.3%	57.7%	100.0%	
			No	100	264	
	Total	962	1438	2400		
		40.1%	59.9%	100.0%		
Residence		Any illness in last two weeks		Total	P value	
		Yes	No			

Rural	Cow milk	Yes	759	1028	1787	0.00
			42.5%	57.5%	100.0%	
		No	109	230	339	
	Total		868	1258	2126	
			40.8%	59.2%	100.0%	
Urban	Cow milk	Yes	66	99	165	0.03
			40.0%	60.0%	100.0%	
		No	10	46	56	
	Total		76	145	221	
			34.4%	65.6%	100.0%	
Slum	Cow milk	Yes	15	32	47	0.40
			31.9%	68.1%	100.0%	
		No	3	3	6	
	Total		18	35	53	
			34.0%	66.0%	100.0%	
Total	Cow milk	Yes	840	1159	1999	0.00
			42.0%	58.0%	100.0%	
		No	122	279	401	
	Total		962	1438	2400	
			40.1%	59.9%	100.0%	
Residence			Any illness in last two weeks		Total	P value
Rural	Packed Juices	Yes	636	878	1514	0.09
			42.0%	58.0%	100.0%	
		No	232	380	612	
	Total		868	1258	2126	
			40.8%	59.2%	100.0%	
Urban	Packed Juices	Yes	58	79	137	0.002
			42.3%	57.7%	100.0%	
		No	18	66	84	
	Total		76	145	221	
			34.4%	65.6%	100.0%	
Slum	Packed Juices	Yes	10	12	22	0.16
			45.5%	54.5%	100.0%	
		No	8	23	31	
	Total		18	35	53	
			34.0%	66.0%	100.0%	
Total	Packed Juices	Yes	704	969	1673	0.003
			42.1%	57.9%	100.0%	
		No	258	469	727	
	Total		962	1438	2400	
			40.1%	59.9%	100.0%	
Residence			Any illness in last two weeks		Total	P value
Rural	Biscuit	Yes	711	974	1685	0.01
			42.2%	57.8%	100.0%	
		No	157	284	441	
	Total		868	1258	2126	
			40.8%	59.2%	100.0%	
Urban	Biscuit	Yes	60	85	145	0.003
			41.4%	58.6%	100.0%	
		No	16	60	76	
	Total		76	145	221	
			34.4%	65.6%	100.0%	
Slum	Biscuit	Yes	15	34	49	0.11
			30.6%	69.4%	100.0%	
		No	3	1	4	
	Total		18	35	53	
			34.0%	66.0%	100.0%	
Total	Biscuit	Yes	786	1093	1879	0.003
			41.8%	58.2%	100.0%	
		No	176	345	521	
	Total		962	1438	2400	
			40.1%	59.9%	100.0%	
Residence			Any illness in last two weeks		Total	P value
			Yes	No		

Rural	Cerelac	Yes	263 46.9%	298 53.1%	561 100.0%	0.001
		No	605 38.7%	960 61.3%	1565 100.0%	
		Total	868 40.8%	1258 59.2%	2126 100.0%	
Urban	Cerelac	Yes	29 46.0%	34 54.0%	63 100.0%	0.03
		No	47 29.7%	111 70.3%	158 100.0%	
		Total	76 34.4%	145 65.6%	221 100.0%	
Slum	Cerelac	Yes	1 100.0%	0 0.0%	1 100.0%	0.34
		No	17 32.7%	35 67.3%	52 100.0%	
		Total	18 34.0%	35 66.0%	53 100.0%	
Total	Cerelac	Yes	293 46.9%	332 53.1%	625 100.0%	0.00
		No	669 37.7%	1106 62.3%	1775 100.0%	
		Total	962 40.1%	1438 59.9%	2400 100.0%	
Residence			Any illness in last two weeks		Total	P value
Rural	Ghee	Yes	150 41.9%	208 58.1%	358 100.0%	0.68
		No	718 40.6%	1050 59.4%	1768 100.0%	
		Total	868 40.8%	1258 59.2%	2126 100.0%	
Urban	Ghee	Yes	15 38.5%	24 61.5%	39 100.0%	0.58
		No	61 33.5%	121 66.5%	182 100.0%	
		Total	76 34.4%	145 65.6%	221 100.0%	
Slum	Ghee	Yes	0 0.0%	3 100.0%	3 100.0%	0.54
		No	18 36.0%	32 64.0%	50 100.0%	
		Total	18 34.0%	35 66.0%	53 100.0%	
Total	Ghee	Yes	165 41.3%	235 58.8%	400 100.0%	0.61
		No	797 39.9%	1203 60.2%	2000 100.0%	
		Total	962 40.1%	1438 59.9%	2400 100.0%	
Residence			Any illness in last two weeks		Total	P value
Rural	Butter	Yes	50 46.7%	57 53.3%	107 100.0%	0.23
		No	818 40.5%	1201 59.5%	2019 100.0%	
		Total	868 40.8%	1258 59.2%	2126 100.0%	
Urban	Butter	Yes	6 30.0%	14 70.0%	20 100.0%	0.81
		No	70 34.8%	131 65.2%	201 100.0%	
		Total	76 34.4%	145 65.6%	221 100.0%	
Slum	Butter	Yes	18 34.0%	35 66.0%	53 100.0%	NA
		No	18 34.0%	35 66.0%	53 100.0%	
		Total	18 34.0%	35 66.0%	53 100.0%	
Total	Butter	Yes	56 44.1%	71 55.9%	127 100.0%	0.35
		No	906 39.9%	1367 60.1%	2273 100.0%	
		Total	962 40.1%	1438 59.9%	2400 100.0%	
Residence			Any illness in last two weeks		Total	P value
Rural	Egg	Yes	415 39.8%	629 60.2%	1044 100.0%	0.33
		No	453 41.9%	629 58.1%	1082 100.0%	
		Total	868 40.1%	1258 59.9%	2126 100.0%	

Urban	Egg	Yes	40.8%	59.2%	100.0%	0.14
		No	33	47	80	
			41.3%	58.8%	100.0%	
	Total		43	98	141	
			30.5%	69.5%	100.0%	
Slum	Egg	Yes	34.4%	65.6%	100.0%	0.10
		No	13	32	45	
			28.9%	71.1%	100.0%	
	Total		5	3	8	
			62.5%	37.5%	100.0%	
			18	35	53	
			34.0%	66.0%	100.0%	
Total	Egg	Yes	461	708	1169	0.53
		No	501	730	1231	
			39.4%	60.6%	100.0%	
	Total		962	1438	2400	
			40.7%	59.3%	100.0%	
Residence			40.1%	59.9%	100.0%	
			Any illness in last two weeks		Total	P value
			Yes	No		
Rural	Green veg	Yes	791	1063	1854	0.00
		No	77	195	272	
			28.3%	71.7%	100.0%	
	Total		868	1258	2126	
			40.8%	59.2%	100.0%	
Urban	Green veg	Yes	69	95	164	0.00
		No	7	50	57	
			42.1%	57.9%	100.0%	
	Total		76	145	221	
			34.4%	65.6%	100.0%	
Slum	Green veg	Yes	16	34	50	0.26
		No	2	1	3	
			66.7%	33.3%	100.0%	
	Total		18	35	53	
			34.0%	66.0%	100.0%	
Total	Green veg	Yes	876	1192	2068	0.00
		No	86	246	332	
			42.4%	57.6%	100.0%	
	Total		962	1438	2400	
			25.9%	74.1%	100.0%	
Residence			40.1%	59.9%	100.0%	
			Any illness in last two weeks		Total	P value
			Yes	No		
Rural	Non veg	Yes	300	462	762	0.31
		No	568	796	1364	
			39.4%	60.6%	100.0%	
	Total		868	1258	2126	
			40.8%	59.2%	100.0%	
Urban	Non veg	Yes	25	39	64	0.35
		No	51	106	157	
			39.1%	60.9%	100.0%	
	Total		76	145	221	
			34.4%	65.6%	100.0%	
slum	Non veg	Yes	12	31	43	0.07
		No	6	4	10	
			60.0%	40.0%	100.0%	
	Total		18	35	53	
			34.0%	66.0%	100.0%	
Total	Non veg	Yes	337	532	869	0.34
		No	625	906	1531	
			38.8%	61.2%	100.0%	
	Total		962	1438	2400	
			40.8%	59.2%	100.0%	
Residence			40.1%	59.9%	100.0%	
			Any illness in last two weeks		Total	P value
			Yes	No		
Rural	Fresh food	Yes	824	1177	2001	0.22
		No	44	81	125	
			41.2%	58.8%	100.0%	
	Total		868	1258	2126	
			35.2%	64.8%	100.0%	
			40.8%	59.2%	100.0%	

Urban	Fresh food	Yes	73 36.0%	130 64.0%	203 100.0%	0.12
		No	3 16.7%	15 83.3%	18 100.0%	
		Total	76 34.4%	145 65.6%	221 100.0%	
Slum	Fresh food	Yes	11 29.7%	26 70.3%	37 100.0%	0.36
		No	7 43.8%	9 56.3%	16 100.0%	
		Total	18 34.0%	35 66.0%	53 100.0%	
Total	Fresh food	Yes	908 40.5%	1333 59.5%	2241 100.0%	0.11
		No	54 34.0%	105 66.0%	159 100.0%	
		Total	962 40.1%	1438 59.9%	2400 100.0%	

Table 5. Socio cultural practices affecting morbidity

Residence			Any illness in last two weeks		Total	P value
			Yes	No		
Rural	Massage	Yes	336 42.1%	462 57.9%	798 100.0%	0.36
		No	532 40.1%	796 59.9%	1328 100.0%	
		Total	868 40.8%	1258 59.2%	2126 100.0%	
Urban	Massage	Yes	40 32.3%	84 67.7%	124 100.0%	0.48
		No	36 37.1%	61 62.9%	97 100.0%	
		Total	76 34.4%	145 65.6%	221 100.0%	
Slum	Massage	Yes	5 71.4%	2 28.6%	7 100.0%	0.04
		No	13 28.3%	33 71.7%	46 100.0%	
		Total	18 34.0%	35 66.0%	53 100.0%	
Total	Massage	Yes	381 41.0%	548 59.0%	929 100.0%	0.47
		No	581 39.5%	890 60.5%	1471 100.0%	
		Total	962 40.1%	1438 59.9%	2400 100.0%	
Residence			Any illness in last two weeks		Total	P value
			Yes	No		
Rural	Sacred Thread	Yes	343 43.3%	449 56.7%	792 100.0%	0.08
		No	525 39.4%	809 60.6%	1334 100.0%	
		Total	868 40.8%	1258 59.2%	2126 100.0%	
Urban	Sacred Thread	Yes	29 38.2%	47 61.8%	76 100.0%	0.46
		No	47 32.4%	98 67.6%	145 100.0%	
		Total	76 34.4%	145 65.6%	221 100.0%	
Slum	Sacred Thread	Yes	7 29.2%	17 70.8%	24 100.0%	0.57
		No	11 37.9%	18 62.1%	29 100.0%	
		Total	18 34.0%	35 66.0%	53 100.0%	
Total	Sacred Thread	Yes	379 42.5%	513 57.5%	892 100.0%	0.07
		No	583 38.7%	925 61.3%	1508 100.0%	
		Total	962 40.1%	1438 59.9%	2400 100.0%	
Residence			Any illness in last two weeks		Total	P value
			Yes	No		
Rural	Tavez	Yes	121 41.6%	170 58.4%	291 100.0%	0.78
		No	747	1088	1835	

			40.7%		59.3%	100.0%	
	Total		868		1258	2126	
Urban	Tavez	Yes	40.8%		59.2%	100.0%	1.00
		No	10		19	29	
			34.5%		65.5%	100.0%	
			66		126	192	
	Total		34.4%		65.6%	100.0%	
			76		145	221	
Slum	Tavez	Yes	34.4%		65.6%	100.0%	1.00
		No	12		24	36	
			33.3%		66.7%	100.0%	
			6		11	17	
	Total		35.3%		64.7%	100.0%	
			18		35	53	
Total	Tavez	Yes	34.0%		66.0%	100.0%	1.00
		No	143		213	356	
			40.2%		59.8%	100.0%	
			819		1225	2044	
	Total		40.1%		59.9%	100.0%	
			962		1438	2400	
Residence			40.1%		59.9%	100.0%	P value
			Any illness in last two weeks			Total	
Rural	Sacred Band	Yes	11		10	21	0.37
		No	52.4%		47.6%	100.0%	
			857		1248	2105	
	Total		40.7%		59.3%	100.0%	
			868		1258	2126	
Urban	Sacred Band	Yes	40.8%		59.2%	100.0%	1.00
		No	0		1	1	
			0.0%		100.0%	100.0%	
			76		144	220	
	Total		34.5%		65.5%	100.0%	
			76		145	221	
Slum	Sacred Band	Yes	34.4%		65.6%	100.0%	1.00
		No	2		3	5	
			40.0%		60.0%	100.0%	
			16		32	48	
	Total		33.3%		66.7%	100.0%	
			18		35	53	
Total	Sacred Band	Yes	34.0%		66.0%	100.0%	0.43
		No	13		14	27	
			48.1%		51.9%	100.0%	
			949		1424	2373	
	Total		40.0%		60.0%	100.0%	
			962		1438	2400	
Residence			40.1%		59.9%	100.0%	P value
			Any illness in last two weeks			Total	
Rural	Oil	Yes	3		8	11	0.54
		No	27.3%		72.7%	100.0%	
			865		1250	2115	
	Total		40.9%		59.1%	100.0%	
			868		1258	2126	
Urban	Oil	Yes	40.8%		59.2%	100.0%	1.00
		No	1		2	3	
			33.3%		66.7%	100.0%	
			75		143	218	
	Total		34.4%		65.6%	100.0%	
			76		145	221	
Slum	Oil	Yes	34.4%		65.6%	100.0%	1.00
		No	1		3	4	
			25.0%		75.0%	100.0%	
			17		32	49	
	Total		34.7%		65.3%	100.0%	
			18		35	53	
Total	Oil	Yes	34.0%		66.0%	100.0%	0.34
		No	5		13	18	
			27.8%		72.2%	100.0%	
			957		1425	2382	
	Total		40.2%		59.8%	100.0%	
			962		1438	2400	
Residence			40.1%		59.9%	100.0%	P value
			Any illness in last two weeks			Total	
Rural	Sacred Cloth	Yes	4		8	12	0.78
		No	33.3%		66.7%	100.0%	
			864		1250	2114	
	Total		40.9%		59.1%	100.0%	

			Total	868	1258	2126		
Urban	Sacred Cloth	No	76	8.8%	145	11.5%	NA	
		Total	76	8.8%	145	11.5%		
	Total		76	8.8%	145	11.5%		
Slum	Sacred Cloth	Yes	1	0.1%	2	0.2%	1.00	
		No	17	2.0%	33	2.6%		
	Total		18	2.0%	35	2.8%		
Total	Sacred Cloth	Yes	5	0.6%	10	0.8%	0.79	
		No	957	110.0%	1428	113.5%		
	Total		962	110.6%	1438	114.3%		
Residence	Any illness in last two weeks						P value	
	Rural	Kazal	Yes	573	66.0%	816	66.1%	0.61
			No	295	34.0%	442	35.9%	
Urban	Kazal	Yes	54	6.3%	101	8.1%	0.88	
		No	22	2.6%	44	3.5%		
	Total		76	8.8%	145	11.5%		
Slum	Kazal	Yes	14	1.6%	25	2.0%	0.75	
		No	4	0.5%	10	0.8%		
	Total		18	2.0%	35	2.8%		
Total	Kazal	Yes	641	74.6%	942	75.3%	0.60	
		No	321	37.3%	496	39.7%		
	Total		962	110.6%	1438	114.3%		

Among the children who were applied oil 72.7% did not fell ill in last two weeks and this proportion was high in rural, urban and slum areas. However, this preventive association was not statistically significant. The practice of applying *kazal* did not show any association with illnesses (OR: 1.05; 95% CI: 0.89-1.25). (Table 5)

DISCUSSION

Water and sanitation are not only a matter of public health, but also of poverty, equity, and justice. (United Nations Development Programme. Beyond Scarcity: Power, Poverty and the Global Water Crisis. Human Development Report 2006) Because they are less likely to have access to safe water and sanitation, the poor bear most of the burden of water-related diseases, driving them further into poverty through lost productivity and expenditure on treatment. (Blakely *et al.*, 2005) District level health survey-4, (2012-13) for Himachal Pradesh reported the prevalence of diarrhea and ARI in last two weeks preceding the survey among children of age less than five years of age as 4.5% and 4.6% respectively. (Govt. of India. District level Health survey IV (2011-12). Himachal Pradesh factsheet IIPS. Mumbai: Ministry of Health & Family Welfare; 2013) National family health survey-4 (2015-16) reported the prevalence of diarrhea and ARI in last two weeks preceding the survey among children of age less than five years of age as 10.5% and 0.8% respectively. (Govt. of India. National family Health survey IV (2015-16). Himachal

Pradesh factsheet. IIPS. Mumbai: Ministry of Health & Family Welfare; 2017) A study from Nepal found that slightly more than one-third of the children had suffered from diarrhea during the four weeks prior to the study. (Acharya *et al.*, 2017) Our study reports 9% prevalence of diarrhea. Morbidity reveals impairment in the immune-competence of an organism and may cause death at an early stage of life.

Socio demographic profile

Elizabeth *et al.*, reported that among the under five year children, the prevalence of morbidity was found to be highest among children aged 6-23 months when they weaned off breast milk and introduced to complementary/supplementary food. (Elizabeth and Raj Sherin, 2012) In our study children between age one and three years suffered majority of illnesses. Lower the socio economic status higher the proportion of those who suffered illnesses and this distribution was statistically significant in slums in the current analysis. Children living in *Kuchha* and semi *pucca* houses more commonly suffered from fever than children who lived in *pucca* houses. Children living in *pucca* houses enjoyed better socio- economic status, which in turn ensures better health status. (Elizabeth and Raj Sherin, 2012) The low socio economic status, poor health care utilization and over all compromised living conditions make rural children susceptible for various diseases. (Vyas *et al.*, 2014) The analysis based on sex showed no significant relationship in the occurrence of ARI, Diarrhoea and fever

between male and female child, however the proportion of females suffering from illnesses were higher. The proportion of girl and boy children affected was 78% and 67% respectively in a study from Tamil Nadu. (Raja *et al.*, 2016) Contrastingly a study from Uttarakhand reported that episodes of Diarrhoea, ARI & measles were more common in males as compared to females. (Vyas *et al.*, 2014) Goswami *et al.*, from Ahmedabad and by Marimuthu *et al.*, at Delhi slum reported that majority of the females were either suffering from or have a history of one or more illness within the previous two weeks. (Goswami and Kedia, 2010; Marimuthu *et al.*, 2009)

Drinking water, Personal hygiene and Sanitation

Poor water, sanitation and hygiene conditions are the primary routes of exposure and infection. Cost-effectiveness analyses and cost-benefit analyses suggest that improvements in water and sanitation yield both health and other valuable benefits, not only to those who receive the intervention but also to the public sector. Under the broader definition, sanitation extends to the process whereby people demand, effect, and sustain a hygienic and healthy environment for them. Children not having safe drinking water and sanitary toilet facility suffered more number of episodes of illness as compared to those having safe drinking water and sanitary toilet facility. (Elizabeth and Raj Sherin, 2012) However, this association was found not significant in the present study though strong association of faulty refuse disposal with diarrhoeal episodes has been reported in literature. Study by T. Barne observed that improper excreta disposal and lack of proper drainage system was associated with 47 per cent increase in diarrhoea in children. (Govender *et al.*, 2011) Acharya *et al.*, and other studies reported that children whose mothers used untreated water more commonly suffered from diarrhea than children whose mothers used treated water. (Acharya *et al.*, 2017; Fewtrell and Colford Jr, 2005; Cairncross *et al.*, 2010; Clasen *et al.*, 2006; Garrett *et al.*, 2008; Graf *et al.*, 2008) The study by Sarkar *et al.*, shows that 98 (94.23%) primary school children washed their hands after visiting toilet and 88 (84.62%) washed their hands before eating which in our study was reported by all. Sarkar *et al.*, also reported that almost 75% of the primary school children were suffering from one or more morbidities related to poor personal hygiene. (Sarkar, 2013) Raja *et al.*, from Tamil Nadu reported that paediatric population which drank water which was not purified by any method were more prone to episodes of illness, 74% were affected. (Raja *et al.*, 2016) A study done in rural Ethiopia by Vivas *et al.* shows that 99% of primary school children (mean age 10.8 years) washed their hands before meals, whereas only 15% washed their hands after defecation on the day prior to the interview. (Vivas *et al.*, 2010) In our study daily bathing emerged as a significant protective factor from illnesses. So apart from hand washing, complete washing of body is also an area of concern which needs to be explored. Diarrhea is still believed as not a disease, hence a constraint to scaling up water and sanitation. To date, however, governmental support for community and household-based water and sanitation interventions programmes has not been extensive in most countries. This is due in part to the engineering orientation of the applicable ministries, and their emphasis on larger-scale, infrastructural improvements, especially in urban and peri-urban settings. Household water treatment and safe storage (HWTS), including boiling, chlorinating and filtering water at home, offers the potential for addressing both uncertain water quality and the point of delivery and post collection contamination. Boiling is

considered the most common method of treating water before drinking. Only 10 % of the Indian population report boiling their water before drinking. In our study only 1% of total study population reported boiling as method of purifying water. Gravity water filters, including traditional ceramic candle filters and various commercial filters that incorporate disinfection media are one HWTS option that has achieved scale nationally. (Freeman *et al.*, 2012) In this connection, the Total Sanitation Campaign (TSC) as launched by Government of India in 1999. The TSC gave emphasis on personal hygiene, home sanitation, safe water, garbage disposal and wastewater disposal. It emphasized more on health education, human resource development, and capacity development activities to increase awareness and sanitation demand. This has been scaled up with Swachh Bharat Mission launched in 2014. (http://www.ddws.gov.in/sites/upload_files/ddws/files/pdf/pdf/TechNoteSSHE_0.pdf, 2004)

Feeding habits of children

Nutrition and health interactions are complex and their determinants include: the social, economic, and cultural issues related to making the right food choices; purchasing and eating the 'correct' types of food in 'appropriate' quantities; as well as the daily human activity and behaviour related to food. Societal features, which determine human behaviour and economic well-being as well as climate, tradition, and culture, all affect food consumption patterns and dietary practices. In current study EBF and low birth weight did not show any significant association with illness in among children. Ganguly *et al.* reported that children with lower birth weight i.e. less than 2.5 kgs were more affected (81.8 %) when compared to normal birth weight children. Children who received exclusive breast feeding were more affected compared to those who did not. Inconclusive finding on relation between breast feeding practices and childhood morbidities were reported by Ganguly *et al.* (2015) Appropriate and adequate feeding is a pre-requisite to good nutritional status in any given time of human life because consumption of nutritionally inadequate diet leads to malnutrition. We inquired about regular feeding habits of children who were not exclusively breast fed. It was observed that as reported intake of regular fruit, green vegetables, biscuits, cerelac and packaged fruit juices were associated with increased risk of illness in last two weeks. The probable explanation could be multiple routes of infection either from unhygienic raw fruits and vegetables which are not washed correctly before use. Also role of sanitation is always linked with feeding. Reporting bias cannot be ruled out where people have a tendency to report socially desirable answers regarding eating habits. As having fruits and vegetables in rural areas is not a routine activity in this part of country that mostly rely on cereals and pulses.

Socio cultural practices

Culture is a key term that refers to values and beliefs emanating from one's ethnic and/or religious ethos, typically transmitted across generations as part of the community's identity or 'design for living'. The impact of culture on public health is manifold and it is manifested in at least three main ways: health behaviour, that is, what people do regarding health risks; health attitudes and beliefs, that is, how people feel and think about health and illness; and people's perceptions of and responses to health authorities' public health guidelines and recommendations. (Fox, 1989; Quah, 2007) In the current

analysis we asked the respondents about what customs and practices were prevalent in context to prevention of childhood infections. In India these are region and state specific and people have more faith in these activities than other measures. Massage of child which is considered healthy was not preventive in our analysis. Tying a sacred thread, band, cloth or *taveez* did not yield any association with prevention of illnesses. The age old practice of applying black soot (*Kajal*) in eyes also did not yield any association with illnesses. However, it has been proved to spread infection in eyes and its use is discouraged with bare hands or common applicator. The role which belief system, understanding the concept of disease, illness and health, improvement in the socio-economic status of the people and well planned education can all help in ensuring maximum and most efficient utilization of the health services cannot be over emphasized. (Rumun, 2013)

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