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## Study of morbidity status of school-children from different cultural regions of Punjab, India

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### Abstract

The study aimed to assess the morbidity status of school-children (11-17 years) from different cultural regions of Punjab (N=1050); namely, Majha (n=210), Doaba (n=210) and Malwa (n=630). A school-based cross-sectional survey was conducted in rural and urban government schools of Punjab, between January and June 2016. Thirty-cluster multistage sampling technique was used. Information on any morbidity suffered by the subjects such as gastrointestinal problems (stomach infections, diarrhea), upper respiratory tract infections (cold, cough, sore throat) and fevers (malaria, typhoid, jaundice), was obtained using a questionnaire. Incidence of upper respiratory tract infections and fevers was found to be highest among children from Doaba region; whereas, stomach infections and diarrhea were more prevalent among children from Malwa region. Overall from Punjab, most of the children had upper respiratory tract infections (66%) followed by fevers and stomach infections (22% each); while, least incidences of diarrhea (18%) were reported. The study emphasized the need to prioritize the assessment of infectious diseases with simultaneous evaluation of different methods of nutritional management, which would prevent the severe morbidity and mortality among children.

**Keywords:** Morbidity status, infections, school-children, regions, Punjab

### Introduction

Water, sanitation and hygiene are imperative for health, welfare and sustenance. In developing nations, inadequate or unsafe water, poor sanitation and contaminated food have increased the probability of infectious diseases that can hamper nutrient absorption and diminish appetite, substantially contributing to stunting and other forms of malnutrition<sup>[1, 2]</sup>. According to WHO, fifty percent of the health burden of malnutrition was attributable to the environment, particularly to poor water, sanitation, and hygiene<sup>[3]</sup>. On the other hand, increased access and better services lead to higher levels of school performance and improved economic productivity. Thus, ensuring that all individuals have equal access to food, health and education is not just a moral objective, these are human rights that need to be integrated with proper hygiene education and promotion<sup>[4]</sup>.

Despite the overwhelming importance of sanitation and hygiene, yet in developing countries, large number of people, especially those who are poor do not have these basic human rights. In India, there is a high prevalence of water and sanitation related diseases, which cause many people, especially children to fall sick and die<sup>[5]</sup>. Prospective studies on growth and morbidity associated with nutritional status of children have identified certain infections which are particularly important as causes of poor growth and malnutrition, such as diarrhea, intestinal infestation, respiratory infections and malaria. Consumption of unsafe water, inadequately protected water sources, inappropriate waste disposal and unhygienic conditions around homes has significant implication for spreading infectious and preventable diseases such as cholera, dysentery, hepatitis and especially diarrhea<sup>[6]</sup>. Diarrheal diseases and poor dietary intakes are the principal causes of growth failure in early childhood, which proves that environmental factors like poverty, and not genetic or racial ancestry, account for most of the differences in growth between populations<sup>[1]</sup>. Parasitic infections, such as soil transmitted helminths (worms), caused by a lack of sanitation and hygiene, infect around 2 billion people globally, while an estimated 4.5 billion people are at risk of infection. Such infections can lead to anemia and reduced physical and cognitive development<sup>[7]</sup>.

The impact of repeated or persistent diarrhea on nutrition-related poverty and the effect of malnutrition on susceptibility to infectious diarrhea are reinforcing elements of the same vicious circle, especially amongst children in developing countries. Malnutrition, infection and

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child mortality has an intricate relationship, because poorly nourished children are usually thin or underweight with reduced immunity, and are more vulnerable to infections, primarily because of epithelial integrity and inflammation<sup>18, 9)</sup>. Malnutrition at any stage of childhood affects continued participation and achievement in school and therefore, the lifetime-earning potential of the child<sup>10)</sup>. Nutritional status of children not only reflect the socio-economic status of the family and social well-being of the community, it also depicts the efficiency of health care system and influence of the surrounding environment<sup>11)</sup>. Therefore, considering the substantial relationship between malnutrition and infections, the study aimed to assess the morbidity status of school-children from three regions of Punjab, India.

## Methodology

**Study Sample and Area:** Thirty-cluster multistage sampling technique was used for the study. A total of 5 districts;

including, 1 from Majha (Amritsar); 1 from Doaba (Jalandhar) regions and 3 districts from Malwa region (Ludhiana, Faridkot and Patiala) of Punjab were selected targeting school-going children. In the next stage of sampling, 2 blocks from each district were selected. The last stage included selecting 2 rural and 1 urban government schools from each block selected in order to have a total random sample size of 1050 children in the age group of 11-17 years, representing the school-going children of Punjab state. Proportion of the subjects from rural schools (n=700) was more as compared to urban schools (n=350) because the percentage of rural population to the total population of Punjab is higher. Malwa region makes up the majority of Punjab state (65% of the total area and 59% of the total population), and is considered as the largest region in Punjab. Thus in the study also, the proportion of school-children from Malwa region was more<sup>12)</sup>. The summarized sampling design is shown in Fig. 1.

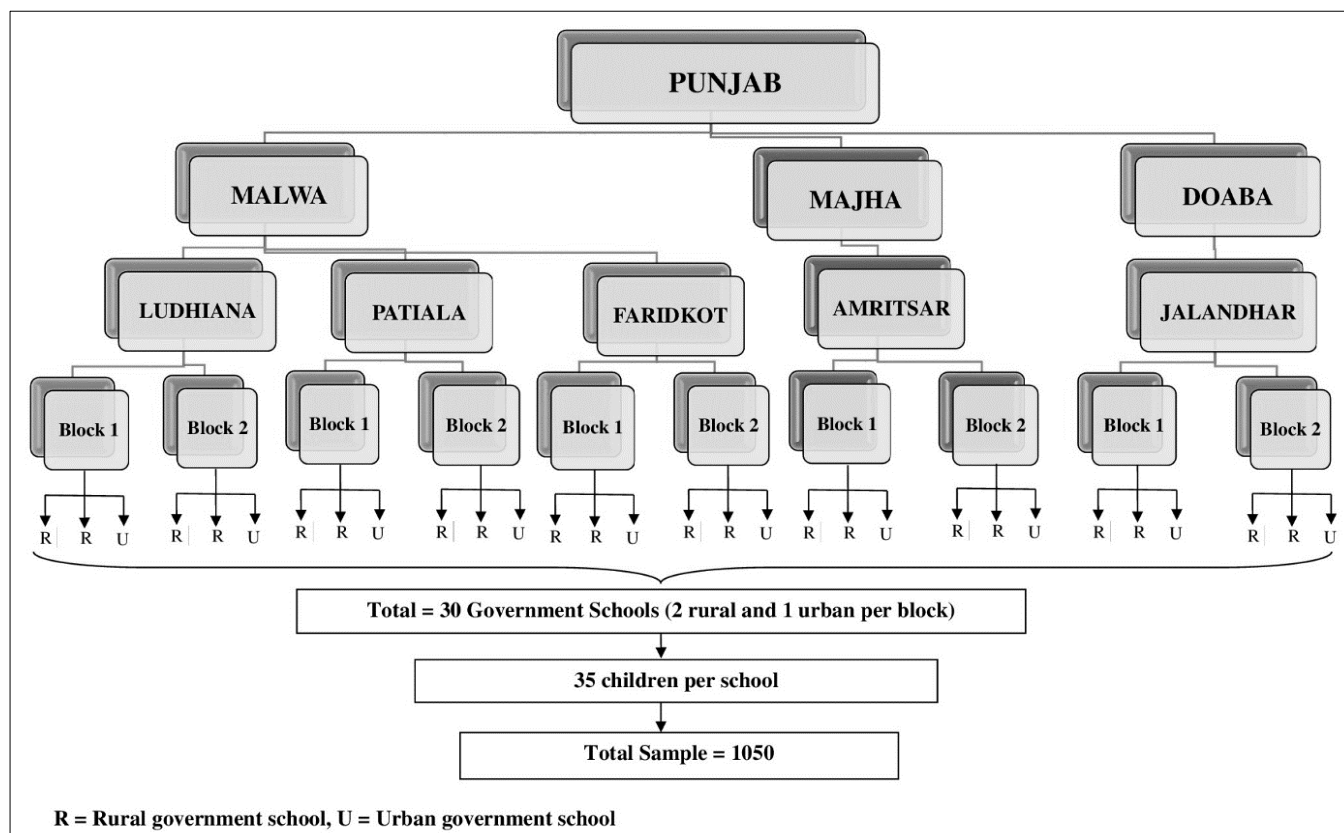


Fig 1: Sampling design for the selection of school children from Punjab

**Demographic and socio-economic profile:** A well-structured questionnaire was formulated to obtain information related to gender (girls and boys); caste (General, Scheduled Caste/SC and Backward caste/BC); religion (Sikh, Hindu and Others-Muslim, Christian, Jain) of the subjects; and parent's education (No education, up to matric and above matric); occupation (farming, business, service, labour, self-employed, non-working); and monthly income ( $\leq$  Rs. 5000, 5001-10,000, 10,001-20,000 and  $>$  20,000).

**Morbidity status:** Self-reported information on any morbidity such as gastrointestinal problems (stomach infections, diarrhea), upper respiratory tract infections (URTIs) (cough, cold, sore throat), suffered by the subjects during the last six months; and fevers (malaria, typhoid, jaundice), suffered by the subjects from the past one year, was recorded.

**Statistical analysis of data:** The completed questionnaire was serially coded and tabulated. For descriptive analysis, the percentages were calculated using SPSS Windows version 23.0 (SPSS Inc., USA).

## Results and Discussion

### Demographic and socio-economic profile

As depicted in table 1, the percentage of girls (58%) in the study sample was more as compared to boys (42%). Majority (68%) of the children from Punjab state were Sikhs, followed by Hindus (29%). Over half (56%) of the subjects belonged to scheduled castes (SC). Majority of the children's mothers (56%) and fathers (62%) were educated up to matric and very few had above matric education, thus indicating that number of those without any worthwhile schooling was quite substantial.

**Table 1:** Demographic and socio-economic profile of school-children from three regions of Punjab

Parameter	Category	Majha (n=210)	Doaba (n=210)	Malwa (n=630)	Punjab (N=1050)
Gender	Girls	119 (57)	130 (62)	364 (58)	613 (58)
	Boys	91 (43)	80 (38)	266 (42)	437 (42)
Religion	Sikh	149 (71)	103 (49)	458 (73)	710 (68)
	Hindu	46 (22)	91 (43)	166 (26)	303 (29)
	Others (Muslim, Christian, Jain)	15 (7)	16 (8)	6 (1)	37 (3)
Caste	General	47 (22)	26 (12.4)	169 (27)	242 (23)
	SC	111 (53)	152 (72.4)	323 (51)	586 (56)
	BC	52 (25)	32 (15.2)	138 (22)	222 (21)
Parent's education					
Mother	No education	100 (48)	41 (19)	242 (38)	383 (37)
	Up to Matric	103 (49)	146 (70)	342 (54)	591 (56)
	Above Matric	7 (3)	23 (11)	46 (7)	76 (7)
Father	No education	61 (29)	27 (13)	176 (28)	264 (25)
	Up to Matric	122 (58)	148 (70)	381 (60)	651 (62)
	Above Matric	27(13)	35 (17)	73 (12)	135 (13)
Parent's occupation					
Mother	Labour	39 (19)	10 (5)	121 (19)	170 (16)
	Housewife/non-working	159 (76)	182 (87)	462 (73)	803 (77)
	Self-employed/service/farming/any other	12 (6)	18 (8.6)	47 (7.5)	77 (7)
Father	Farming	23 (11)	14 (6)	99 (16)	136 (13)
	Business	-	9 (4)	39 (6)	48 (5)
	Service	18 (9)	31 (15)	70 (11)	119 (11)
	Labour	109 (52)	110 (52)	327 (52)	546 (52)
	Self-employed	44 (21)	41 (20)	83 (13)	168 (16)
	Any Other	4 (2)	4 (2)	5 (0.8)	12 (1)
	Non-working/Late	12 (6)	1 (0.5)	7 (1)	21 (2)
Family income (Rs.)	≤ 5000	16 (8)	80 (38.1)	267 (42.4)	363 (35)
	5001-10,000	133 (63)	93 (44.3)	197 (31.3)	423 (40)
	10,001-20,000	48 (23)	26 (12.4)	90 (14.3)	164 (16)
	> 20,000	13 (6)	11 (5.2)	76 (12)	100 (9)

Figures in parentheses represent percentages

Furthermore, labour (52%) was the most pursued occupation of the fathers; and mothers (77%) were mostly housewives. The unemployment was more frequent in mothers in comparison to fathers of the children which might be due to the lower literacy rate and fewer job opportunities for uneducated mothers. Most (75%) of the children studied were from low socio-economic status households, earning ≤ Rs.

10000/month.

#### Morbidity status

Frequency of common morbidities among school-children from three regions of Punjab is shown in table 2; and morbidity status of school-children from three regions of Punjab is presented in Fig. 2.

**Table 2:** Frequency of common morbidities among school-children from three regions of Punjab

Parameter	Majha (n=210)	Doaba (n=210)	Malwa (n=630)	Punjab (N=1050)
<b>a) Gastrointestinal problems</b>				
Stomach infections	26 (12.4)	47 (22.3)	128 (20.3)	201 (19)
	-	5 (2.3)	27 (4.3)	32 (3)
Once/twice a week				
Diarrhea	8 (3.8)	35 (16.6)	25 (4)	68 (7)
	24 (11.4)	-	95 (15)	119 (11)
Frequently				
Monthly				
<b>b) URTIs (cold, cough, sore throat)</b>				
Frequently	128 (60.9)	183 (87)	347 (55)	658 (62)
	3 (1.4)	12 (5.7)	18 (2.8)	33 (4)
Once/twice a week				
<b>c) Fevers (from the past one year)</b>				
Malaria	23 (11)	30 (14.3)	38 (6)	91 (9)
Typhoid	35 (16.6)	34 (16.2)	62 (9.8)	131 (12)
Jaundice	-	-	12 (1.9)	12 (1)

Figures in parentheses represent percentages

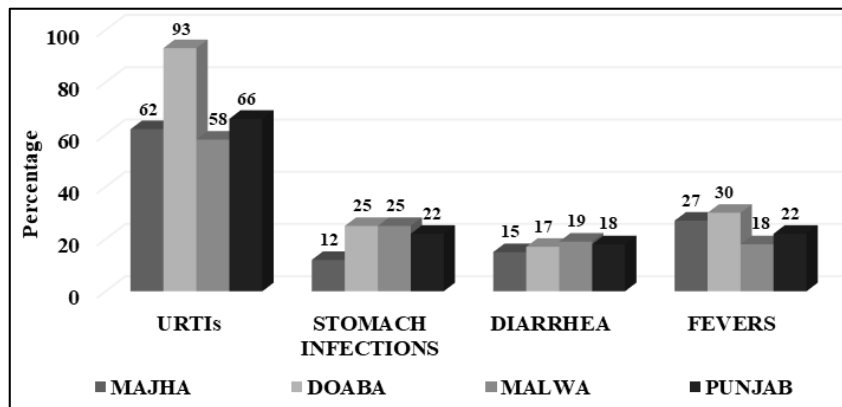


Fig 2: Morbidity status of school-children from three regions of Punjab

### Majha

While assessing the morbidity status of school-children from Majha region, it was observed that, majority (62%) of the subjects had URTIs, followed by fevers (27%), diarrhea (15%) and stomach infections (12%). The incidence of stomach infections and URTIs was reported to occur frequently; whereas, diarrhea occurred monthly in most of the subjects. In contrast to the study results, another study found diarrheal diseases among majority (26%) of the tribal children from West Bengal, followed by acute respiratory infections (25%) and fever (17%) [13]; whereas most of the studies conducted in other parts of the country reported acute respiratory infections as the major cause of morbidity among under five children [14-16]. Gastrointestinal infections impair weight and height gains and physical and cognitive development which are generally attributed to damage to the mucosal barrier and villus atrophy, which reduces nutrient absorption [17].

Children with infections and parasitic infestation were more likely to have anemia, malnutrition and reduced physical and cognitive development than children without morbidities [7, 18]. Poor health among school children, most commonly associated with diarrheal diseases, skin diseases, worm infestations, respiratory infections and dental diseases is resulted from the lack of awareness of the health benefits of personal hygiene. Recurrence of infections often compound the existing poor health of children, compromising children's attendance and performance at school and can result in death. Simple measures like following safe, hygienic practices by children can go a long way in reducing morbidities and thus break the vicious cycle of infection and malnutrition [19].

### Doaba

Majority (93%) of the subjects suffered from URTIs, followed by fevers (30%), stomach infections (25%) and diarrhea (17%). The incidence of stomach infections, diarrhea and URTIs was reported to occur frequently among children. URTIs are common but are unlikely to indicate an underlying medical condition when they occur in isolation [20]; whereas, Juwah *et al.* reported that URTIs were the most commonly associated infections and pallor, jaundice, malaria and fever were the most commonly encountered symptoms in patients (aged 8-16y) with severe anemia [21]. According to WHO, about 3.8 million children aged less than five, die each year from diarrhea and acute respiratory tract infections [22]; and 62% of all deaths in Africa and 31% in South-Asia are due to infectious diseases [23]. Various studies have highlighted that consumption of clean water, hand-washing and basic hygiene behaviour could prevent acute respiratory infections, diarrhea,

and skin infections [8, 9]. In this context, educating people to adopt good hygiene behaviour is especially important to alleviate overall prevalence of malnutrition in the region. However, despite much evidence supporting the effectiveness of personal hygiene behaviour, they are yet to be practiced widely.

### Malwa

The incidence of stomach infections and URTIs was reported to occur frequently; whereas, diarrhea occurred monthly in majority of the subjects from Malwa region. Most (58%) of the subjects suffered from URTIs, followed by stomach infections (25%), diarrhea (19%) and fevers (18%). Similarly, most common co-morbidity found among malnourished children from Karnataka, was respiratory tract infection (44%) followed by acute gastro enteritis and fever (22.5% each) [24]; whereas, Mehta *et al.* reported fever to be the most common disease (50%) followed by cold (33%) and diarrhea (16%) among children in Ludhiana district of Malwa region [25]. Southern Punjab consisting of the Malwa region is facing problems related to deteriorating health (such as cancer, gastrointestinal irritation, neurological disorder premature ageing and deformities among children) due to unavailability of clean and safe drinking water for food preparation and to irrigate food crops [26]. Infections adversely affect nutritional status through reduction in dietary intake and intestinal absorption, increased catabolism and sequestration of nutrients that are required for tissue synthesis and growth [27].

### Regional disparity analysis for morbidity status

In general, the results of the study indicated that incidence of URTIs and fevers was found to be highest among children from Doaba region; whereas gastrointestinal problems (stomach infections and diarrhea) were more prevalent among children from Malwa region. Regional disparity in the morbidity status of school-children may be attributed to differences in their hygiene and sanitation behaviour, eating habits, poor housing conditions, young child feeding and caring practices, age, gender, nutritional status of the child; and due to poor treatment and disposal of waste, certain socio-environmental factors, or climatic conditions of the region [28-30]. Other studies have documented factors such as type of fuel used for cooking, maternal illness, mother's age and level of maternal power to take decisions to be significantly associated with morbidities [31]. Accelerated programs promoting access to safe drinking water along with water treatment practices, and better household environment may prove effective in reducing the incidence of childhood morbidity [32].

## Punjab state

### A detailed region-wise analysis of the data further showed the following findings on aggregate

Majority (66%) of the children from Punjab suffered from URTIs, followed by fevers and stomach infections (22% each); whereas, diarrheal episodes (18%) were found to be the lowest among all the morbidities reported in children. The incidence of stomach infections and URTIs was reported to occur frequently, whereas, diarrheal incidences occurred monthly in most of the subjects.

Similarly, in Nigeria, diarrhea was reported in the least number of subjects (9%) with severe anemia<sup>[33]</sup>. Consistent to the study results, Gupta *et al.* found acute respiratory infections to be the leading causes of morbidity, followed by diarrheal diseases, skin infections and fever in under five children from rural area of Jammu<sup>[34]</sup>. In developing countries like India, the triad of malnutrition, acute respiratory infection and diarrheal diseases are the most common causes of illness and death among under-five age group children<sup>[35]</sup>. The most common signs and symptoms of URTIs were coughing, sneezing, congestion and a runny nose. However, often regarded as trivial and categorized as mild morbidity, URTIs do not receive serious attention. Iron supplementation is remarkably effective for the treatment of URTIs in areas where iron deficiency is endemic and easy to implement<sup>[36]</sup>.

The findings of the study are in line with several other studies from India, where URTIs were found to be the leading cause of morbidity in the children; however, the prevalence rates reported in the study are much higher than those reported from other states<sup>[37]</sup>. On the other hand, the findings lay in contrast with other studies<sup>[26, 38]</sup>, where diarrheal episodes along with other infections seemed to be more prevalent among children. The most common risk factors for acquiring respiratory infections are poverty, restricted family income, low parental education level, lack of breastfeeding and most importantly, malnutrition<sup>[39]</sup>. Beside these causes, the analysis highlighted that most of the observed differences between Punjab and other Indian states, may be driven by Punjab specific characteristics, popularly known as stubble trouble i.e. burning of straw, which led to remarkable increase in respiratory problems in the population<sup>[40]</sup>. This situation is further confirmed by NASA which showed a very strong concentration of fires in Punjab and very few in other states of India<sup>[41]</sup>. There is evidence that higher exposure to the resulting smoke is very harmful for children<sup>[42]</sup>. Treatment and prevention of infections has its own rules and should consist of early, aimed antibiotic therapy, long and appropriate re-convalescence, elimination of all possible focuses and origins of infection and complete examination of the child's immune-status<sup>[20]</sup>.

## Conclusion

The number of programs implemented by Government of Punjab have resulted in impressive improvement in morbidity and mortality indicators but the results have not been consistent. The study findings showed that incidence of URTIs and fevers was found to be highest among children from Doaba region; whereas gastrointestinal problems (stomach infections and diarrhea) were more prevalent in Malwa region. Among all the morbidities, URTIs (66%) were found to be highest among children from government schools of Punjab, followed by fevers and stomach infections (22% each); whereas, diarrheal episodes (18%) were reported to be the lowest. Prevalence of infections among Punjabi children may be attributed to their socio-economic factors, as most of

the subjects were belonging to low-income household; and their parents had low educational level. Development of every child is partly shaped by schools, where comprehensive care and well-being of children during the school years is provided. As health and education are intimately related, health education should give more emphasis to prevent health problems rather than providing cure<sup>[43]</sup>.

**Competing Interests:** Authors have declared that no competing interests exist.

**Authors' Contributions:** Sukhdeep Kaur, Kiran Bains and Harpreet Kaur, equally contributed to conception and design; analysis and interpretation; drafted and critically revised manuscript. All authors read and approved the final manuscript.

**Ethical approval:** Institutional Ethical Committee's approval has been obtained prior to the start of the study. Consent to conduct the survey on the students was also ascertained from the parents through the school authorities.

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