

Original Research Article

Morbidity pattern and nutritional status of Anganwadi students in a selected gram-panchayat in Tripura, India

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ABSTRACT

Background: Early childhood care and development (ECCD) was a critical foundation for overall growth and development, not only of children but society on the whole which has severely neglected in India. According to NFHS almost half of all children under three were underweight. Prevalence of acute illness at the household level in Tripura was 12%. It is needed to draw the attention of people towards the person possessing nutrition and morbidity. The objectives of this study is to assess the nutritional status, prevalence of major morbidities and examine the impact of socio-demographic factors on nutritional status and morbidities in a block under study in Tripura.

Methods: In 2023 after receiving approval from KJSCE, IGNOU study centre, Mumbai, selected anganwadi students of Mechuria gram-panchayat of Tripura state were surveyed. We utilised Univariate, Bivariate and chi-square methods for this study.

Results: In Mechuria gram-panchayat 21% anganwadi students were underweight, 10% were obese and 57% Anganwadi students were suffered from acute illness. Common cold was 70% which was the highest prevalence. Major health problems were decreased with increasing parent's age and their education and also raise this health problem with increasing age of Anganwadi teachers and helpers. It may be due to overburden of their other responsibilities.

Conclusions: Common cold, underweight and obese were the major health problem and government hospital played the main role in providing treatment facility in this village. Limitation of this study included that this study based on self-reporting.

Keywords: Anganwadi student, Acute disease, Children's health, Nutritional health, Tripura

INTRODUCTION

Early Childhood Care and Development (ECCD) is crucial for the holistic growth of children and the advancement of society. In India, however, ECCD has faced significant neglect, evidenced by alarming rates of malnutrition and high infant and under-five mortality rates among children under six. Interventions aimed at addressing these issues have shown minimal progress.^{1,2} The National Family Health Survey (NFHS-5) reports that only 44% of children aged 12-23 months in India receive complete immunization, and only 50% of

pregnant women attend at least three antenatal check-ups. Additionally, the infant mortality rate remains concerning, with 57 deaths per 1,000 live births.³ Alarming, merely 1% of the total union budget is allocated to children under six, indicating substantial underfunding of this critical demographic.⁴

The Supreme Court Case People's Union for Civil Liberties (PUCIL) vs. Union of India established the right to food as a legal entitlement under the Integrated Child Development Services (ICDS) scheme, a key initiative for children under six.⁵ Grassroots organizations,

including those involved in the right to food campaign and the People's Health Movement India, have actively participated in advocacy and policy interventions.⁶ The implementation of programs such as the Sarva Shiksha Abhiyan (SSA) and the National Rural Health Mission (NRHM) has enhanced support for ECCD in India, primarily under the Ministry of Women and Child Development.^{7,8,9} The Eleventh Five-Year Plan focuses on improving ICDS, particularly in Infant and Young Child Feeding (IYCF) initiatives and outreach for children under three, while also supporting working women in the informal sector.¹⁰ The responsibility of caring for young children is a collective societal obligation, with Accredited Social Health Activists (ASHA) and Anganwadi workers playing critical roles in delivering nutrition through the ICDS program at the grassroots level.¹¹⁻¹³

Nutritional anaemia is a significant concern in developing countries, impacting infants, young children, and women. Approximately one billion people globally suffer from iron deficiency, with rates as high as 40% in these regions. Among pregnant women, nearly two-thirds are affected, highlighting a stark contrast with developed nations.¹⁴ In India, the District Level Household Survey reported that 28% of children under five are underweight and 51% of children aged 6-59 months suffer from anaemia.¹⁵ The prevalence of anaemia is notably higher in urban areas (53%) compared to rural settings, while Scheduled Tribe and Scheduled Caste children exhibit lower rates.^{16,17} Morbidity, defined as a departure from physical or psychological well-being, encompasses both acute and chronic conditions.¹⁸ The NFHS-5 reveals a concerning prevalence of acute illness, with 12% of households reporting such cases, particularly in rural areas (13%) compared to urban regions (10%). Common acute illnesses include fever, affecting 34% of the population.³

This study advocates for comprehensive strategies addressing the nutritional needs of children aged 0-6 years, recognizing the interconnections between health, growth, nutrition, and development. The ICDS program was designed as a comprehensive approach through Anganwadi schemes to meet the holistic needs of young children, emphasizing that the nutritional status and morbidity of children significantly affect maternal health.

METHODS

Research area

India's north-eastern states, including Tripura, are marked by diverse cultures and landscapes, contributing to unique lifestyles among the approximately 40 million residents, who comprise 3.1% of the national population.¹⁹ Tripura's population in the 2011 Census was 3.67 million. Tripura's literacy rate was 87.2%.¹⁹ Dhalai District is largely tribal, with over 70% of its area being hilly and forested, situated between the Atharamura and Sakhan ranges, which borders Bangladesh.²⁰ Mechhuriya village, in the

Salema Block, had a population of 2,553 in 2011, growing to 5,633 by 2020, and covers 1,104 hectares with a literacy rate of 77.83%.^{20,21} The community is predominantly Hindu and Christian, which shapes their socio-economic conditions.

Sampling design

This research employed a cross-sectional design conducted in Mechuria village, located in the Dhalai district of Tripura, India. The researcher had prior familiarity with the community, which facilitated the study's execution. A total of 210 respondents were selected from the seven Anganwadi Centres in the village, ensuring a representative sample of the target population. To achieve this, students from each Anganwadi Centre were stratified into two groups: strata-I (boys) and strata-II (girls). From each stratum, 15 students were randomly selected using a random number table, leading to a total of 30 students (15 boys and 15 girls) from each centre. This resulted in a comprehensive sample of 210 respondents drawn from a total enrolment of 305 students across all centres.

Survey tools

Data collection for this study was conducted using semi-structured questionnaires directed at both the staff of the Anganwadi Centres and the parents of the selected students. Two distinct questionnaires were utilized: the first focused on the operational aspects of the Anganwadi Centre, comprising four sections: Section A, which gathered information about the Centre; Section B, which detailed the Teacher's information; Section C, addressing the Helper's information; and Section D, concerning the Students. The second questionnaire aimed to capture background information related to the study population and also included four sections: Section A for information about the Students/Children; Section B for Household information; Section C for details about the Students' Mothers; and Section D for information regarding the Students' Fathers.

The data obtained through these questionnaires were designed to provide insights into both the operational dynamics of the Anganwadi Centres and the socio-demographic conditions of the students and their families, thus facilitating a comprehensive analysis of the study's objectives.

Study period

Data for this study was collected from Mechuria village in October 2023.

Inclusion and exclusion criteria

The current study included all children enrolled in Anganwadi Centres, while those not enrolled were excluded from this study.

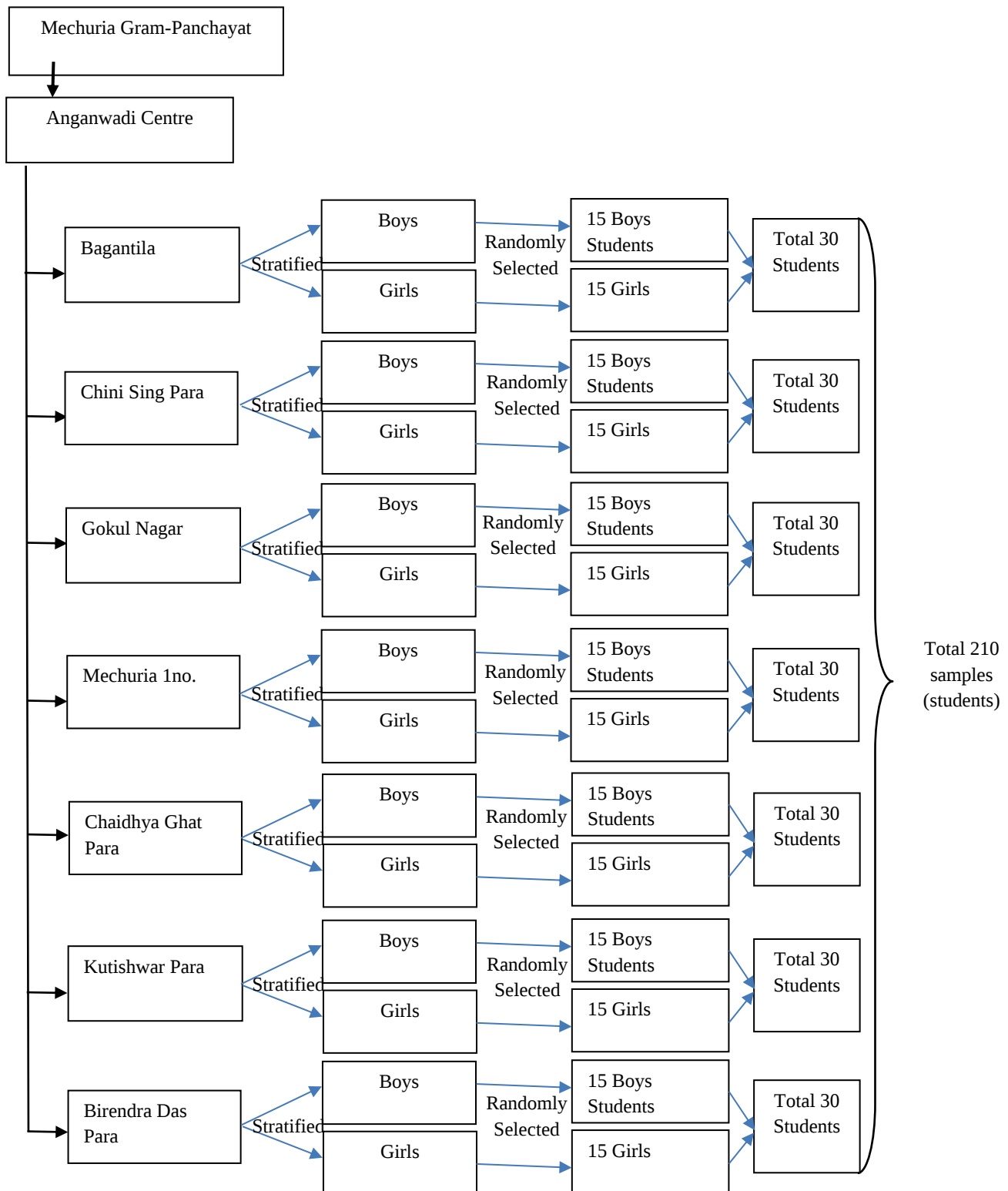


Figure 1: Flow chart of sampling design for this study.

Data analysis

To assess the nutritional level of the Anganwadi students, Body Mass Index (BMI) was calculated for each sample by measuring height and weight. Height was measured using a measuring tape in centimetres, while weight was recorded using a digital weight scale in kilograms with

assistance from an Anganwadi worker. For children under two years of age, body length was measured in a lying position. Each measurement for height and weight was taken three times, and the average of these three measurements was used for analysis. BMI was computed as the body mass in kilograms divided by the square of height in meters, expressed in kg/m^2 , following the World

Health Organization (WHO) growth standards, with results interpreted using age- and sex-specific%iles.²²

To evaluate nutritional status, estimate the prevalence of major morbidities, and examine the influence of socio-demographic factors, univariate and bi-variate analysis was employed. This method explores the relationship between two variables, allowing for hypothesis testing concerning their association; however, it does not determine causal relationships. The chi-square test was utilized to assess the distribution of independent variables, comparing the expected frequencies to the observed frequencies across various categories. Chi-squared tests were calculated based on a sum of squared errors or sample variance, providing insights into

significant differences within the data. Data were entered into MS Excel and subsequently analysed using Stata.

RESULTS

Nutritional status

In the Mechuria gram-panchayat above half of Anganwadi centre's students were in healthy weight category, 22% were underweight and 10% were obese. Underweight Students were highest in Mechuria 1no Anganwadi Centre. Overweight Students were most high in Birendra Das Para Anganwadi Centre. All the Anganwadi Centre except Mechuria Anganwadi Centre had nearly 10% of obese student (Table 1).

Table 1: Anganwadi centre wise percentage distribution of BMI status among Anganwadi students in Mechuria gram-panchayat, Tripura.

Name of the centre	Under weight	Healthy weight	Over weight	Obese	P value
Bagantila	15.00	55.00	15.00	15.00	<0.01
Chini Sing Para	23.53	47.06	17.65	11.76	
Gokul Nagar	25.00	55.00	10.00	10.00	
Mechuria 1no.	45.00	45.00	5.00	5.00	
Chaidhya Ghat Para	20.00	60.00	5.00	15.00	
Kutishwar Para	35.00	50.00	5.00	10.00	
Birendra Das Para	5.00	65.00	20.00	10.00	
Overall	21.66	55.33	12.44	10.6	

Morbidity

Above half of Anganwadi students were suffered from acute illness during last one month in the Mechuria gram-panchayat. Highest shared of acute illness was common cold which was 70%, and lowest was other acute illness 2% (Figure 2). It observed that Mechuria 1no Anganwadi Centre Anganwadi centre had the highest prevalence of acute illness (Table 2).

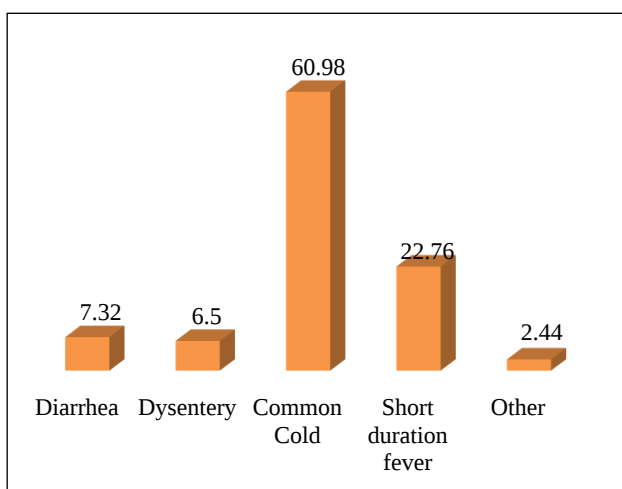


Figure 2: Distribution of different types of acute illness among Anganwadi students in Mechuria gram-panchayat, Tripura.

Table 2: Prevalence percentage of any acute illness among Anganwadi students in Mechuria gram-panchayat, Tripura.

Name of the centre	Percentage	p-value
Bagantila	8.13	<0.01
Chini Sing Para	4.88	
Gokul Nagar	11.38	
Mechuria 1no.	12.20	
Chaidhya Ghat Para	8.94	
Kutishwar Para	8.95	
Birendra Das Para	11.38	
Overall	56.68	

Leading health problem

This data indicates that common cold, short duration of fever, underweight and obese was the leading health problem in this village and presented in Table 3. All these major health problems were decreased with increasing age of father and mother and also improve this health problem with increasing age of Anganwadi teachers and helpers. It observed that student's age group of 1-2 years common cold was highest with 45% and according to age group increasing common cold was decreasing.

Prevalence of obese was also decreasing with increasing age, the prevalence of obese was more in the lowest age group with 17% and lowest in higher age group.

Prevalence percentage of the common cold and short duration fever were highest in a male with 37 and 16% respectively as compare to female. Prevalence of

underweight and obese was highest in a female with 24 and 11% respectively as compare to male.

Table 3: Number (n) of student and prevalence (%) of the common cold, short duration fever, underweight, obese Anganwadi students in Mechuria gram-panchayat according to selected background characteristics.

Demographic variable	Total student (N)	Common Cold (%)	Short Duration Fever (%)	Underweight (%)	Obese (%)
Age group of children (years)					
1-2	76	44.74	10.53	18.42	17.11
2-3	68	35.29	11.76	16.18	11.76
3-4	47	27.27	6.82	29.55	4.55
4-5	29	17.24	31.03	31.03	0.00
P value		*	#	*	*
Sex of children					
Male	110	37.04	15.74	19.44	10.19
Female	110	32.11	10.90	23.85	11.09
P value		*	#	*	*
Cast of the household					
SC	141	37.86	16.43	17.86	13.57
OBC	37	24.32	10.81	29.73	5.41
General	40.00	32.5.	2.50	27.50	5.00
P value		*	*	*	*
Religion of the household					
Hindhu	184	35.52	14.75	19.67	11.48
Muslim	36	29.41	2.94	32.35	5.88
P value		*	*	*	*
Income source of household					
Agriculture	76	320	10.67	18.67	13.33
Daily labor	95	38.30	17.02	26.60	6.38
Others	89	31.25	8.33	16.67	14.58
P value		*	*	*	*
BPL classified					
Yes	115	30.70	19.30	22.68	9.65
No	105	38.83	5.83	19.42	11.56
P value		#	*	*	*
Children in household					
1 Child	109	36.11	12.04	22.22	12.04
Above 1	111	33.03	13.06	21.10	9.17
P value		*	*	#	#
House structure					
Pucca	37	39.39	6.06	18.18	12.12
Kachha	184	33.7	14.13	22.28	10.33
P value		*	*	*	*
Type food in household					
Veg	33	39.39	9.09	24.24	3.03
Non veg	187	33.70	13.59	21.20	11.96
P value		*	*	*	*
Drinking water source in household					
Hand pump	141	35.46	14.18	16.31	11.35
Borehole	79	32.89	10.53	31.58	9.21
P value		*	*	#	*
Drinking water treatment					
Yes	189	33.33	13.23	21.16	12.17
No	31	42.86	10.71	25.00	0.00
P value		*	*	*	*

Continued.

Demographic variable	Total student (N)	Common Cold (%)	Short Duration Fever (%)	Underweight (%)	Obese (%)
Toilet facility in household					
Flash toilet	40	32.43	8.11	16.22	10.81
Pit latrine	180	35	13.89	22.78	12.08
P value		*	*	*	*
Mother's age					
Below 25	59	37.93	17.24	22.41	15.52
26 to 28	112	37.84	12.61	21.62	11.71
Above 28	49	22.92	8.33	20.83	2.08
P value		*	*	*	*
Mother's education					
Upto primary	11	54.55	18.18	27.27	0.00
Primary- high school	196	33.16	13.27	21.43	11.22
Above high school	13	30.00	2.12	20.00	10.00
P value		#	*	*	#
Father's age					
Below 30	87	46.51	15.12	24.42	13.95
30 to 35	90	24.72	13.48	19.10	11.24
Above 35	43	30.95	7.14	21.43	2.38
P value		*	#	*	#
Fathers education					
Upto primary	11	11.11	44.44	22.22	11.11
Primary- high school	194	36.08	12.37	21.13	10.31
Above high school	15	28.57	0.00	28.57	14.29
P value		#	#	#	*
Fathers occupation					
Agriculture	70	33.33	10.14	15.94	11.59
Daily labour	98	40.21	16.49	26.80	8.25
Other	52	25.49	9.80	19.61	13.73
P value		*	*	*	*
Centre structure					
Pucca	197	35.03	13.71	23.35	10.66
Kacha	23	30.00	5.00	5.00	10.00
P value		#	#	#	#
Teachers age					
Below 35	98	27.84	10.31	15.46	12.37
35 to 40	62	31.67	13.33	23.33	6.67
Above 40	60	48.33	16.67	30.00	11.67
P value		*	*	*	*
Teachers education					
Upto high school	197	35.03	11.68	20.3	10.66
Graduate/ Diploma	23	30.00	25.00	35.00	10.00
P value		*	*	*	*
Helpers age					
Below 35	78	25.97	12.99	23.38	11.69
35 to 40	81	32.50	11.25	26.25	7.50
Above 40	61	48.33	15.00	13.33	13.33
P value		*	*	*	*
Drinking water source in centre					
Hand pump	100	42.00	11.00	22.00	11.00
Well or borehole	98	25.77	15.46	24.74	10.31
Other source	22	40.00	10.00	5.00	10.00
P value		#	*	*	*
Toilet facility of centre					

Continued.

Demographic variable	Total student (N)	Common Cold (%)	Short Duration Fever (%)	Underweight (%)	Obese (%)
Septic tank	80	33.75	10.00	30.00	7.50
Pit with slab	22	40.00	10.00	5.00	10.00
Open / Other	118	34.19	15.38	18.8	12.82
P value		#	*	*	*

NOTE #: The distribution was not significant, *: The distribution was significantly distributed

It was observed that SC students more suffered from common cold, short duration fever and an obesity problem, whereas underweight problem was more in General. In this village, Hindu and Muslim people lived, but Hindu Anganwadi students were more suffered from different morbidity and obese problem. One important point observed that in Muslim underweight children were more as compare to Hindu children. Prevalence of common cold, short duration of fever and underweight highest in those children whose parents working as daily labor 38%, 17%, and 27% respectively. Those parents of the Anganwadi students were BPL classified their socio-economic condition was as we all know very low, their children were so much exposed to fever and underweight.

People who used hand pump as a drinking water source and also use pit latrine their children were more suffered from various morbidities, underweight, and obese problem. Prevalence of common cold was highest in those Anganwadi centre who were use pit latrine with 40%, the prevalence of short duration of fever was highest in those Anganwadi centre who used the open/other toilet with 16%.

DISCUSSION

The data on the health and nutritional status of children in the Anganwadi Centres of Mechuria gram-panchayat highlights critical challenges in child health and development, particularly in rural settings with limited resources. These findings align with existing literature on the factors influencing childhood nutrition and morbidity, underscoring the interplay between socio-economic status, sanitation, parental age, and the type of drinking water and toilet facilities available.

Nutritional status

In Mechuria gram-panchayat, more than half of the children in Anganwadi Centres were classified within a healthy weight range, while 22% were underweight and 10% were obese. Research has shown that underweight prevalence in rural India is often influenced by household poverty and food insecurity, impacting children's nutritional intake and growth.^{23,24} For instance, the prevalence of underweight children was notably higher at the Mechuria 1no Anganwadi Centre, which could be linked to poorer access to food and healthcare resources in this particular locality. Studies by Swaminathan et al. demonstrate that poverty and inadequate access to healthcare contribute significantly to undernutrition in

rural Indian children.²⁵ Additionally, Birendra Das Para Anganwadi Centre recorded a higher rate of obesity, which is consistent with findings suggesting a nutritional transition in rural India, where increased access to processed foods may lead to higher rates of obesity among children.²⁶

Morbidity

Over half of the Anganwadi children experienced acute illnesses in the previous month, with common colds being the most prevalent condition. The high incidence of common colds and other short-duration fevers among young children is consistent with studies indicating that malnutrition and frequent infections create a vicious cycle, leading to compromised immunity and increased susceptibility to infections.²⁷ According to Bhandari and Bahl, environmental factors such as poor sanitation and overcrowding, which are common in rural settings, often exacerbate the frequency and severity of respiratory infections among children.²⁸ Mechuria 1no Anganwadi Centre had the highest prevalence of acute illness, which could reflect its socio-economic conditions, including limited access to sanitation facilities and healthcare, both of which are known to impact children's health significantly.²⁹

Socio-economic and parental influences

The data indicates that children's health and nutritional status improve with the increasing age of parents and Anganwadi workers. Studies have demonstrated that parental age and experience can positively influence child health outcomes by improving childcare practices and access to health services.³⁰ This improvement may also reflect increased economic stability with parental age, providing better resources for children.³¹ Moreover, children of parents working as daily laborers had the highest rates of underweight and acute illness, reflecting the challenges faced by economically disadvantaged families who may lack the resources to meet their children's nutritional needs.³²

Sanitation and water sources

The data also highlights significant links between sanitation practices, water sources, and child health outcomes. Families relying on pit latrines or hand pumps for drinking water had higher incidences of morbidity, particularly common colds and underweight conditions among children. These findings align with studies that correlate the use of unimproved sanitation and water

sources with higher rates of gastrointestinal and respiratory infections, which can further contribute to undernutrition.^{33,34} Pit latrines and open defecation practices increase children's exposure to pathogens, and research indicates that such exposure can lead to environmental enteropathy, a condition that impairs nutrient absorption and contributes to undernutrition.³⁵

Caste and religious disparities

The data further reveals disparities in health outcomes based on caste and religion. For example, SC children showed higher rates of common cold, fever, and obesity, while underweight prevalence was higher among children from general castes. Previous studies have indicated that social determinants, including caste and religion, are significant predictors of health inequalities in India, as marginalized groups often face barriers to accessing quality healthcare, sanitation, and nutritional support.³⁶ The differential impact on Hindu and Muslim children's nutritional and health status in this study reflects the broader socio-economic disparities often seen within these communities.^{3,31}

These findings underscore the need for targeted interventions to address the specific health and nutritional challenges faced by children in rural Anganwadi Centres. Programs like the Integrated Child Development Services (ICDS) should consider expanding their scope to include community-based sanitation and hygiene interventions, given the clear links between sanitation practices and health outcomes. Additionally, promoting nutrition education among parents and Anganwadi workers, especially those from economically disadvantaged backgrounds, could help improve childcare practices.^{11,37} Addressing these factors comprehensively could mitigate the high rates of morbidity and undernutrition observed in rural settings like Mechuria gram-panchayat.

The study's strengths lie in its detailed, Centre-specific data collection across multiple Anganwadi Centre, which provides a nuanced understanding of health and nutritional patterns among young children in Mechuria gram-panchayat. By examining diverse factors such as age, gender, socioeconomic background, and access to sanitation and water sources-the study gives a well-rounded view of how these determinants affect child health outcomes. This focus on various risk factors allows for targeted interventions and highlights areas for improvement in nutrition, hygiene practices, and healthcare access within the community.

CONCLUSION

The data from Mechuria gram panchayat's Anganwadi Centres reveals numerous health issues, including elevated rates of underweight, obesity, and acute diseases among youngsters. Elements including as socio-economic status, parental employment, sanitation, and availability of drinking water substantially affect these results. Socio-

economic inequalities, inadequate sanitation, and restricted healthcare resources intensify the likelihood of malnutrition and illness, highlighting the necessity for focused health measures.

Recommendations

To address health issues among children in Mechuria gram-panchayat, it is recommended to implement targeted nutrition and hygiene programs in Anganwadi Centres, focusing on balanced diets to manage underweight and obesity. Improved sanitation and access to clean drinking water should be prioritized to reduce morbidity rates. Engaging parents and teachers with training on hygiene and nutrition is essential, particularly for vulnerable groups. Integrating these initiatives with broader programs like ICDS and SSA will ensure comprehensive support, helping to enhance children's health outcomes across socioeconomic backgrounds.

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REFERENCES

1. United Nations Children's Fund (UNICEF), India. State of Children in India 2021: A Report on Early Childhood Care and Development. UNICEF; 2021. Available at: <https://www.unicef.org/india/reports/state-children-india-2021>. Accessed 01 May 2024.
2. Planning Commission of India. National Nutrition Policy 2014. Government of India; 2014. Available at: <https://www.nnp.gov.in>. Accessed 01 May 2024.
3. Ministry of Health and Family Welfare, Government of India. National Family Health Survey (NFHS-5) 2019-20: India Report. Mumbai: International Institute for Population Sciences; 2020. Available at: <http://rchiips.org/nfhs/NFHS-5Reports/India.pdf>. Accessed 01 May 2024.
4. HAQ: Centre for Child Rights (HAQCRC). Budget Analysis Report: Children in India – The Reality. New Delhi; 2007. Available at: <http://www.haqcrc.org/wp-content/uploads/2018/05/Children-in-India-The-Reality-Report.pdf>. Accessed 01 May 2024.
5. Supreme Court of India. Peoples Union for Civil Liberties (PUCL) vs. Union of India and Others. Writ Petition (Civil) 196 of 2001; 2001. Available

- at: <https://indiankanoon.org/doc/180949/>. Accessed 01 May 2024.
6. Citizens Initiative for the Rights of Children under Six. Focus on Children Under Six; 2006. Available at: <http://www.rightsofchildren.org>. Accessed 01 May 2024.
7. Ministry of Women and Child Development. National Mission for Children and Adolescent Health: An Overview; 2009. Available at: <http://wcd.nic.in/>. Accessed 01 May 2024.
8. Government of India. Sarva Shiksha Abhiyan: Framework for Implementation. Ministry of Human Resource Development; 2001. Available at: <http://safal.ncert.gov.in/sarvashikshaabhiyan.pdf>. Accessed 01 May 2024.
9. Government of India. National Rural Health Mission (NRHM): Framework for Implementation; 2005. Available at: <https://nhm.gov.in/images/pdf/nrhm-framework.pdf>. Accessed 01 May 2024.
10. Government of India. Eleventh Five Year Plan (2007-2012). Planning Commission; 2001. Available at: <http://planningcommission.gov.in/plans/planrel/five-yr/11th/11thplanch1.pdf>. Accessed 01 May 2024.
11. Government of India. Integrated Child Development Services (ICDS): Operational Guidelines. Ministry of Women and Child Development; 2006. Available at: <http://wcd.nic.in/>. Accessed 01 May 2024.
12. Jain A, Rani S. The role of ASHA workers in the ICDS programme. *J Health Manag*. 2017;19(2):211-22.
13. National Institute of Public Cooperation and Child Development. The role of Anganwadi workers in India: A study on child health and nutrition. New Delhi: NIPCCD; 2019. Available at: <http://www.nipccd.nic.in>. Accessed 01 May 2024.
14. Teoteja GS, Singh P. Prevalence of anaemia in non-pregnant adolescent girls in India. *Indian Council of Medical Research*; 2002. Available at: <https://www.icmr.gov.in>. Accessed 01 May 2024.
15. District Level Household Survey (DLHS-IV). Ministry of Health and Family Welfare, Government of India; 2012-13. Available at: <http://www.rchiips.org/dlhs/dlhs4.html>. Accessed 01 May 2024.
16. United Nations Population Fund (UNFPA). World Population Report 2007. New York: UNFPA; 2007. Available at: <https://www.unfpa.org/publications/world-population-report-2007>. Accessed 01 May 2024.
17. World Health Organization (WHO), United Nations Children's Fund (UNICEF), United Nations University (UNU). Vitamin and mineral nutrition information system. WHO; 2001. Available at: <https://www.who.int/nutrition/publications/vitamins/9789241592278/en/>. Accessed 01 May 2024.
18. World Health Organization. Towards a common language for functioning, disability and health: International Classification of Functioning, Disability and Health (ICF). Geneva, Switzerland; 2002. Available at: <https://cir.nii.ac.jp/crid/1573668925447490176>. Accessed 01 May 2024.
19. Census of India. Census 2011 - Tripura. Government of India; 2011. Available at: https://censusindia.gov.in/2011census/dchb/1604_P-ART_B_DCHB_TRIPURA.pdf. Accessed 01 May 2024.
20. Government of Tripura. District Profile of Dhalai; 2018. Available at: <http://tripurainfo.com/>. Accessed 01 May 2024.
21. Government of Tripura. Village census data; 2020. Available at: <http://tripurainfo.com/>. Accessed 01 May 2024.
22. World Health Organization. Obesity and overweight. Available at: <https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight>. Accessed 01 May 2024.
23. Patel V, et al. The burden of childhood malnutrition in India. *Lancet Child Adolesc Heal*. 2019;3(8):572-81.
24. Yusuf ZI. Social Determinants of Overweight and Obesity Among Children in the United States. *Int J MCH AIDS*. 2020;9(1):22-33.
25. Swaminathan S. Trends in child malnutrition in rural India. *Indian Pediatr*. 2019;56(8):635-42.
26. Popkin BM. The nutrition transition and obesity in the developing world. *J Nutr*. 2010;131(3):871S-3S.
27. Bhutta ZA, Ali S, Cousens S, Ali TM, Haider BA, Rizvi A, et al. Interventions to address maternal, newborn, and child survival: what difference can integrated primary health care strategies make?. *The Lancet*. 2008;372(9642):972-89.
28. Bhandari N, Bahl R. Causes and risk factors of acute lower respiratory infections among children in developing countries. *Indian J Pediatr*. 2009;76(4):423-9.
29. Choudhary A, Parthasarathy P. Sanitation and health outcomes in rural India: A cross-sectional study. *J Publ Heal*. 2021;43(4):856-63.
30. Bergh C. Parental age and child outcomes. *Fertility and Sterility*. 2019;111(6):1036-46.
31. International Institute for Population Sciences (IIPS), ICF. National Family Health Survey (NFHS-4), India, 2015-16. Mumbai: IIPS; 2017. Available from: <http://rchiips.org/nfhs/NFHS-4Reports/India.pdf>. Accessed 01 May 2024.
32. Pal A, Manna S, Dalui R. Undernutrition and associated factors among children aged 5-10 years in West Bengal, India: a community-based cross-sectional study. *Egypt Pediatric Association Gaz*. 2021;69(40)
33. Hunter PR, MacDonald AM, Carter RC. Water supply and health. *PLoS Med*. 2010;7(11).
34. Prüss-Ustün A, Bartram J, Clasen T, Colford Jr JM, Cumming O, Curtis V, et al. Burden of disease from inadequate water, sanitation and hygiene in low-and middle-income settings: a retrospective analysis of

- data from 145 countries. *Trop Medi Internat Heal*. 2014;19(8):894-905.
35. Ngure FM, Reid BM, Humphrey JH, Mbuya MN, Pelto G, Stoltzfus RJ. Water, sanitation, and hygiene (WASH), environmental enteropathy, nutrition, and early child development: Making the links. *Ann N Y Acad Sci*. 2014;1308(1):118-28.
36. Nayar KR. Social exclusion, caste & health: A review based on the social determinants framework. *Indian J Med Res*. 2007;126(4):355-63.
37. Delisle HFR. The double burden of malnutrition in mothers and the intergenerational impact. *Ann N Y Acad Sci*. 2008;1136:172-84.

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