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## Original Article

# Social determinants of stunting in rural area of Wardha, Central India

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## ABSTRACT

**Background:** Stunting is a consequence of long term, cumulative inadequacies of health and nutrition. Health system uses underweight for growth monitoring for its simplicity. Lately there is renewed interest in stunting and especially severe acute malnutrition. Stunting is a relatively neglected indicator. It is therefore imperative to understand the causes of stunting early in infancy and childhood, so that preventive measures can be taken. Hence, the present study was undertaken to study the social determinants of stunting in rural Wardha.

**Methods:** The present cross-sectional study was undertaken in three Primary Health Centres (PHCs) of Wardha district with total population of 88,187. The sample was drawn from three PHC areas by 30-cluster sampling technique. Stunting was defined using WHO Child Growth Standards for 'height-for-age'. 'Height-for-age' values below 2 standard deviations were considered as stunted while below 3 standard deviations were considered 'severe stunting'.

**Result:** Prevalence of stunting was observed to be 52.3% and severe stunting was 25.1%. The significant determinants of stunting were found to be age, father's education, fathers' occupation, low income, not receiving Vitamin-A supplement during last 6 months and having anaemia. Sex, caste, mother's education and mothers' occupation did not contribute significantly to the stunting.

**Conclusion:** Low income and related factors such as father's education and his occupation are important determinant of the stunting. Father being the decision maker, his education is of importance. Vitamin-A supplementation and anaemia as surrogate indicators for access to health care also found out to be significant determinants of stunting.

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## Introduction

Height-for-age indicates linear growth in a child. Low height-for-age also called stunting is a consequence of long term,

cumulative inadequacies of health and nutrition. In young age it indicates continuing process of failing to grow while in older children, it means failed to grow.<sup>1</sup> It shows a different biological process than wasting.<sup>2</sup> The potential for catch-up

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growth depends on delay in maturation as delay in maturation prolongs the growth period. However in developing countries, delay in maturation is usually very small and only small proportion of the growth retardation is compensated which ultimately results in short stature in adulthood.<sup>3</sup> Stunting associated with impaired cognitive development.<sup>4</sup> There is increased susceptibility to infection and increased risk of mortality among the stunted children.<sup>5</sup> In adulthood, they suffer from reduced work capacity and increased risk of adverse reproductive outcomes.<sup>6</sup>

In India stunting is widespread. NFHS-III reported it to be 48% with 51% in rural area.<sup>7</sup> Health system uses underweight for growth monitoring for its simplicity. Stunting is a relatively neglected indicator. It is a proxy indicator for multifactorial deprivation of a population. For stunting to be prevalent, likely causes could be dietary inadequacies, infectious diseases and social deprivation.<sup>8</sup> It is therefore imperative to understand the social determinants of stunting early in infancy and childhood, so that preventive measures can be taken. Hence, the present study was undertaken to study the social determinants of stunting in rural Wardha.

## Material and methods

### Study setting

The present cross-sectional study was undertaken in three Primary Health Centres (PHCs) of Wardha district; namely Anji, Gaul and Talegaon with total population of 88,187. The study site was located in rural Wardha district, about 758 km east from state capital Mumbai. The health care delivery system of the district comprised of state owned sub-centres, Primary Health Centres at primary level, Rural Hospital and District Hospital at secondary level; and two private medical colleges at tertiary level. Apart from this structure, there were private doctors, practicing allopathic and Indian Systems of Medicines. The study was approved by the institutional ethical committee.

### Sample size and sampling technique

The main objective of the study was to study the acute morbidities among children under 3 years findings of which are published earlier and the sample size came out to be 960. The detailed methodology has been presented there.<sup>9</sup> The sample was drawn from three PHC areas by 30-cluster sampling technique, where numbers of cluster were proportional to population in each of three PHCs. From each cluster, 33 children below 3 years (11 children from each of 0–11 months, 12–23 months and 24–35 months age groups) were chosen by systematic randomization. Thus, the total sample studied was 990 children. The study was approved by the institutional ethical committee.

### Data collection

After obtaining informed consent, the trained interviewer interviewed 990 mothers of below 3 years children using pre-designed and pre-tested questionnaire by paying house to

house visit. To assess the nutritional status, weight was obtained by Salter scale provided by United Nations Children Fund (UNICEF). The height was measured for children between 24 and 35 months while length was measured for children below 24 months as per the WHO guidelines on anthropometry.<sup>1</sup>

Haemoglobin concentration in children between 6 and 35 months ( $n = 772$ ) was estimated using 'Filter Paper Cyanmethemoglobin Method'.<sup>10</sup> Using WHO guidelines, anaemia was defined as haemoglobin concentration less than 110 g/L.<sup>11</sup>

### Statistical analysis

The data was analyzed by using SPSS 12.0.1 software package. Stunting was defined using WHO Child Growth Standards for 'height-for-age'. 'Height-for-age' values below 2 standard deviations were considered as stunted while below 3 standard deviations were considered 'severe stunting'. For nutritional analysis Anthro 2005 software was used.<sup>12</sup>

Associations between risk factors and the stunting were evaluated by calculating Crude and adjusted odds ratio and their 95% confidence interval. To calculate odds ratio (OR), the stunting and severe stunting was taken as dependent variable with dichotomous outcome (yes, no) while age group (0–11, 12–23, 24–35 months), sex (male, female), caste (open, other backward caste, scheduled caste, scheduled tribe), parent's education (>10 years, 1–10 years, uneducated), parent's occupation, socio-economic status, and anaemia (no anaemia, anaemia) as independent variables.

## Results

### Study subjects

Out of the 990 subjects studied, 16.5% were below 6 months of age and almost similar in year of life each. 44.9% were males, 54.3% belonged to open and OBC castes. 66.3% of the children had received vitamin-A supplementation over last 6 months period and 73.9% were anaemic. 92.5% children had received age-appropriate immunization.

### Prevalence of stunting

In the present study prevalence of stunting was observed to be 52.3% and severe stunting was 25.1%. Stunting was highest (62.4) in the age group 24–35 months. It was 27.0% and 48.5% in age groups of 0–5 months and 6–11 months respectively. Similar trend was observed for severe stunting as well. Higher proportion of stunting and severe stunting was observed in male children, children from scheduled tribe, children whose parents had less education, children whose parents were unskilled manual labourer, children from lowest economic quartile, those who did not receive vitamin-A supplementation during last 6 months and were anaemic (Table 1).

### Social determinants of stunting

Odds of being stunted were higher in older age groups than the younger age group. It was 2.5, 3.5 and 4.5 times higher in

**Table 1 – Determinants of stunting.**

Variable	Number studied N (%)	Stunting			
		Stunting, N (%)	Odds ratio (95% CI)	Sever stunting, N (%)	Odds ratio (95% CI)
Overall	990 (100)	518 (52.3)	–	248 (25.1)	–
Age					
0–5 months	163 (16.5)	44 (27.0)	1	12 (7.4)	1
6–11 months	167 (16.9)	81 (48.5)	2.5 (1.6–4.1)	37 (22.2)	4.2 (2.1–8.9)
12–23 months	330 (33.3)	187 (56.7)	3.5 (2.4–5.3)	97 (29.4)	6.7 (3.5–13.3)
24–36 months	330 (33.3)	206 (62.4)	4.5 (3.0–6.8)	102 (30.9)	8.1 (4.3–16.1)
Sex					
Female	445 (44.9)	223 (50.1)	1	92 (20.7)	1
Male	545 (55.1)	295 (54.1)	1.2 (0.9–1.5)	156 (28.6)	1.5 (1.1–2.1)
Caste					
Open and OBC	538 (54.3)	280 (52.0)	1	138 (34.8)	1
Scheduled caste	209 (21.1)	101 (48.3)	0.9 (0.6–1.1)	45 (29.4)	0.8 (0.5–1.2)
Scheduled tribe	243 (24.5)	137 (56.4)	1.2 (0.9–1.6)	72 (40.5)	1.2 (0.9–1.8)
Mother's education					
Illiterate	69 (7.0)	35 (50.7)	1.2 (0.7–2.0)	18 (34.6)	1.4 (0.7–2.7)
Upto 10 years	645 (65.2)	354 (54.9)	1.4 (1.1–1.9)	176 (37.7)	1.7 (1.2–2.4)
More than 10 years	276 (27.9)	129 (46.7)	1	374 (26.9)	1
Father's education					
Illiterate	67 (6.8)	40 (59.7)	1.8 (1.1–3.0)	21 (43.8)	2.1 (1.1–3.9)
Upto 10 years	558 (56.4)	311 (55.7)	1.5 (1.2–2.0)	154 (38.4)	1.7 (1.2–2.4)
More than 10 years	365 (36.9)	167 (45.8)	1	73 (26.9)	1
Mother's occupation					
House Work	651 (65.8)	321 (49.3)	1.6 (0.6–4.8)	147 (30.8)	1.5 (0.4–6.8)
Service or business	16 (1.6)	6 (37.5)	1	3 (23.1)	1
Skilled work	14 (1.4)	7 (50.0)	1.6 (0.4–7.5)	3 (30.0)	1.4 (0.2–10.5)
Farm labour	157 (15.9)	88 (56.1)	2.1 (0.7–6.6)	47 (40.5)	2.3 (0.6–10.7)
Unskilled manual labour	152 (15.4)	96 (63.2)	2.8 (1.0–8.8)	48 (46.2)	2.8 (0.8–13.4)
Father's occupation					
House work	10 (1.0)	7 (70)	3.4 (0.8–16.8)	5 (62.5)	6.6 (1.4–35.9)
Service or business	136 (13.7)	55 (40.4)	1	20 (19.8)	1
Skilled work	97 (9.8)	52 (53.6)	1.7 (1.0–2.9)	25 (35.7)	2.2 (1.1–4.5)
Farm labour	398 (40.2)	206 (51.8)	1.6 (1.1–2.4)	102 (34.7)	2.1 (1.3–3.8)
Unskilled manual labour	349 (35.3)	198 (56.7)	1.9 (1.3–2.9)	96 (38.9)	2.6 (1.5–4.6)
Income					
Lowest quartile	288 (29.1)	160 (55.6)	1.5 (1.1–2.1)	78 (37.9)	1.6 (1.1–2.5)
Second quartile	286 (28.9)	160 (55.9)	1.5 (1.1–2.1)	82 (39.4)	1.1 (2.6)
Third quartile	179 (18.1)	89 (49.7)	1.2 (0.8–1.7)	39 (30.2)	1.1 (0.7–1.9)
Highest quartile	237 (23.9)	109 (46.0)	1	49 (27.7)	1
Vitamin-A supplementation <sup>a</sup>					
Received during last 6 month	439 (66.3)	241 (54.9)	1	119 (37.5)	1
Not received	223 (33.7)	152 (68.2)	1.8 (1.3–2.5)	78 (52.4)	1.8 (1.2–2.7)
Immunization					
Appropriate for age	916 (92.5)	481 (52.5)	1	231 (34.7)	1
Not appropriate for age	74 (7.5)	37 (50)	0.9 (0.6–1.5)	17 (31.5)	0.9 (0.5–1.6)
Anaemia					
No anaemia	258 (26.1)	105 (40.7)	1	32 (17.3)	1
Anaemia	732 (73.9)	413 (56.4)	1.9 (1.4–2.5)	216 (40.4)	3.2 (2.1–5.0)

a Eligible for vitamin-A supplementation after 9 months of age.

6–11 months, 12–23 months, and 24–36 months as compared to 0–5 months. Similar association was observed for severe stunting with higher odds ratio for each age group.

Male children had higher relative odds of 1.2 for stunting when compared with their female counterparts. The association was not statistically significant. However, for severe stunting male gender was at significantly higher odds than the females. No significant association was observed between castes and stunting. Children belonging to scheduled caste and scheduled tribe were at almost similar risk of stunting as that of children from higher castes such as open and OBC.

Children whose parents had education of 10 years or less had higher odds of being stunted/severely stunted than those children whose parents had education of more than 10 years. The relative odds of stunting was higher among children with illiterate father (OR = 1.8) than that of illiterate mother (OR = 1.2). No significant association was observed between mother's occupation and the children's stunting. Conversely, father's occupation had significant impact on stunting. Children who father were skilled workers and labourers including those working at home had significant higher odds of being stunted (odds ratio ranged from 1.6 to 3.4; except for "house

work category”) or severely stunted (odds ratio ranged from 2.1 to 6.6) than those whose father were engaged in service or business. Similarly higher relative odds of stunting/severe stunting were observed among children who belonged to lower income quartile than that of highest income quartile.

Children who did not receive vitamin-A supplementation during last 6 months were at higher risk of stunting/severe stunting than those received the supplementation; odds ratio being 1.8. Similar association was observed with anaemia. Children having anaemia had 1.9 and 3.2 times higher odds of being stunted and severely stunted respectively than children who were not anaemic. Stunting did not differ significantly by immunization status.

## Discussion

According to UNICEF, there were an estimated 170 million stunted children living in developing countries in 2005. South Asia is the region with the highest percentage of its under-5 population stunted. Burundi’s population has the most severe level of chronic malnutrition, but India has the largest absolute number of stunted children.<sup>13</sup> In the present study, the prevalence of stunting was found to be 52.3%. NFHS-III reported it to be 51% in rural India.<sup>7</sup>

Child’s optimal growth occurs during first 2 years of life. This is a critical period as intervention during this period can reverse the effects of malnutrition. But once this opportunity is missed, the child will never make up the difference in growth and will be adversely affected for rest of the life.<sup>14</sup> Hence, it is important to focus and invest in early childhood. The present paper analyses the social factors leading to stunting. Stunting reflects a long standing processes affecting growth of the children adversely. Factors that affect the growth can be classified as factors which can be taken care of through an immediate intervention such as feeding practices, environmental and personal hygiene, nutritional intake, and factors which need long duration of interventions such as parental education, income or gender. Other class of factors are access and utilization of health services.

Higher odds of stunting were found among male children as compared to their female counterparts in contrast to the popular belief where females are supposed to be nutritionally neglected and hence are expected to be more stunted. A meta-analysis of 16 Demographic and Health Surveys in Sub-Saharan Africa also found that male children are more stunted. The authors attributed it to the biological vulnerability of male children than the female children which is also a reason for higher morbidity and mortality of males than females in early life.<sup>15</sup>

In the present study, children belonging to scheduled tribe, parents having less education and income, and children of labourer parents had higher odds of stunting than their counterparts. The findings highlights the social exclusion as main determinant of stunting as it was more common among marginalized population groups; being marginalized increased the odds of stunting. Though these are not new findings, they were looked as distant players and difficult to handle in resource crunch settings. There is an urgent need to address these social determinants to achieve optimal health outcomes

as highlighted by the Commission on Social Determinants of Health.<sup>16</sup>

Also, those who were excluded by the health services (not received vitamin-A supplementation over last 6 months and children with anaemia) had higher odds of stunting. The health care system is suffering from inequities related to access and health outcomes. The reasons could be non-availability of human resources, fragmented approach and low funding among many others.

The social exclusion underpins immediate causes stunting by limiting people’s abilities to grow or earn sufficient amount of food. A similar observation are made by the Commission on Social Determinants of Health and recommends to improve daily living conditions, tackle the inequitable distribution of power, money and resources, and measure and understand the problem and assess the impact of action.<sup>16</sup> In India, initiatives like National Rural Health Mission which seeks to provide universal access to equitable, affordable and quality health care is an attempt towards bridging the inequities in health care and Right to Education which aims to provide education to each and every child reflects governments’ commitment to tackle the issue of social exclusion.<sup>17,18</sup> There other schemes and programs such as National Rural Employment Guarantee Scheme and Rashtriya Swasthya Bima Yojana i.e. health insurance scheme for the poor are on the similar lines.<sup>19,20</sup>

To conclude, low income and related factors such as father’s education and his occupation are important determinant of the stunting. Father being the decision maker, his education is of importance. Vitamin-A supplementation and anaemia as surrogate indicators for access to health care also found out to be significant determinants of stunting.

## Conflicts of interest

All authors have none to declare.

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