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Original Research Article

A STUDY TO ESTIMATE THE PREVALENCE OF SEVERE ACUTE MALNUTRITION AMONG HOSPITALIZED CHILDREN AGED 2 MONTHS –59 MONTHS AND ITS DETERMINANTS IN BUNDELKHAND MEDICAL COLLEGE, SAGAR

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ABSTRACT

INTRODUCTION- Undernutrition is identified as a major health and nutritional problem in India. It is not only an important cause of childhood morbidity and mortality, but also leads to permanent impairment of physical and possibly mental growth of the survivors. Considering the high prevalence of malnutrition in India and Madhya Pradesh, the study was done to assess the prevalence of Severe Acute Malnutrition among hospitalized children aged 2 months to 59 months and its determinants in Bundelkhand region of Madhya Pradesh.

METHOD- It is a descriptive observational study conducted at Pediatrics department of Bundelkhand Medical College, Sagar, where all the hospitalized children aged 2- 59 months were evaluated for SAM as per WHO criteria. The data regarding determinants of SAM was collected from selected children's parents by a predesigned questionnaire.

RESULT- A total of 1390 children aged 2 – 59 months were admitted and screened. 120 children were diagnosed as SAM. The prevalence of SAM was found to be 8.6%. Among 120 children, 100(83.3%) children were wasted, 103(85.8%) children were underweight, 71 (59.2%) were stunted and 33(27.5%) children were oedematous. Maternal education (75.8% upto middle school only), improper immunization (10% unimmunized, 21.7% partially immunized), lower socioeconomic status(118(97.8%) belonged to lower, upper lower and lower middle class), kachcha house (65.8%), open field defecation (40.8%), bottle feeding (30%) were important determinants of SAM.

CONCLUSION- The prevalence of Severe Acute Malnutrition in our study found to be 8.6% which is comparable to studies conducted on SAM in hospitalized patients. The common determinants observed in SAM children were low literacy rate among mothers, poor immunization coverage, lower socioeconomic status, kachcha housing condition, poor sanitary facility, bottle feeding.

KEYWORDS- severe acute malnutrition, children 2-59 months, under 5 children, prevalence, undernutrition.

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1. INTRODUCTION:

Undernutrition is a set of conditions that results from inadequate consumption, poor accretion, or excessive loss of nutrients.[1] Undernutrition is identified as a major health and nutritional problem in India. It is not only an important cause of childhood morbidity and mortality, but also leads to permanent impairment of physical and possibly mental growth of the survivors.[2] Childhood undernutrition is an underlying cause in an estimated 45 % of all deaths among under 5 children.[1]

As per latest National family health survey (NFHS 5) data, in India 32.1% of under 5 children are underweight, 19.3% of children are wasted and 7.7% children under 5 years of age are severely wasted.[3]As per NFHS 5 data the documented prevalence of underweight, wasting and severe wasting in MP is 33%, 19% and 6.5% respectively.[3]

Undernourished children have higher risk of infections and morbidity. Undernutrition is strongly associated with shorter adult height, poor lean weight, less schooling, low cognition, reduced economic productivity and for women, lower offspring birth weight [1].

Considering the high prevalence of malnutrition in India and as well as in Madhya Pradesh, this study was done to assess the prevalence of SAM among hospitalized children aged 2 months to 59 months and its determinants in Bundelkhand region of Madhya Pradesh.

2. MATERIAL AND METHODS

- **STUDY DESIGN**-: This was an observational cross-sectional study conducted at Department of Pediatrics Bundelkhand Medical College, Sagar, Madhya Pradesh, for 1 year from 1st October 2021 to 30th September 2022. All hospitalized children aged between 2 months – 59 months were included in the study. The children who were aged less than 2 months, more than 59 months and those suffering from chronic diseases were excluded. Also, the patients whose parents did not give consent were excluded.
- **SAMPLE SIZE**-Sample size was calculated using the formula

$$= \frac{z^2(p*q)}{d^2}$$

A sample size of 90 cases were calculated and additional 30 cases were added to complete collection for 1 year so the prevalence can be calculated accurately.

- **DATA COLLECTION:** Anthropometric measurements including weight (W), height (H), weight for height (WFH), presence or absence of bipedal oedema and Mid upper arm circumference (MUAC) were measured at the time of admission. The children were evaluated for SAM, using WHO criteria for SAM.
- SAM is defined as any one of the following-
  - **i.** Weight for height Z score < -3 SD
  - **ii.** MUAC below 11.5cm
  - **iii.** Presence of bipedal oedema

- **STATISTICAL ANALYSIS:** Demographic variables were reported as counts and percentages. The collected data were entered into Microsoft Excel spreadsheet. SPSS software version 26 was used for analysis of the data. Statistical tests used for analysis were Chi-squared ($\chi 2$) test or Fisher's exact test for categorical data. A p-value of less than 0.05 was considered as statistically significant.

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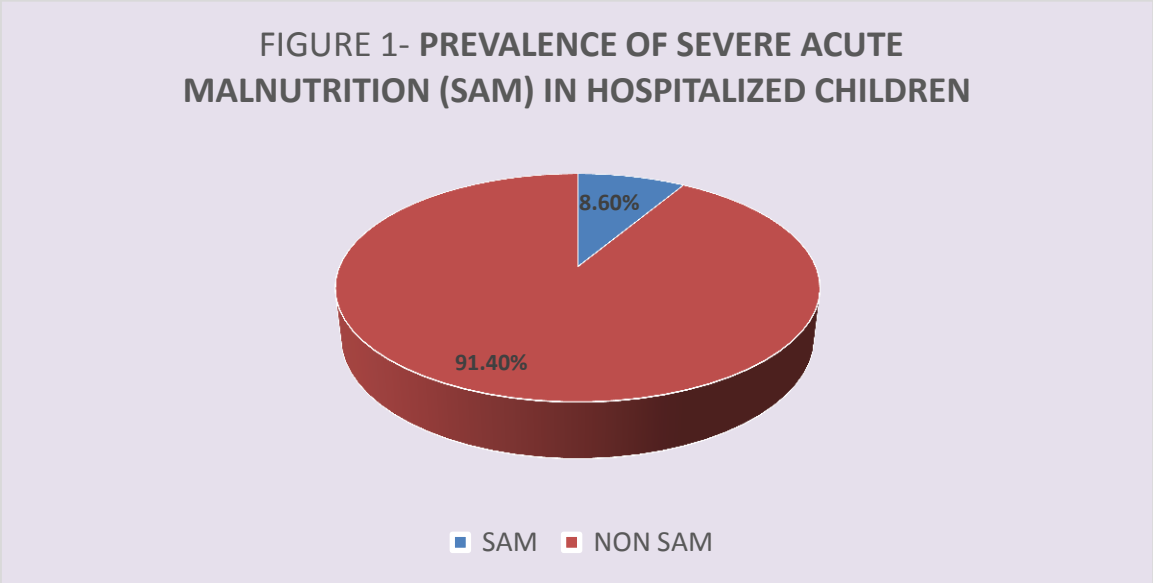
3. RESULTS

A total of 1390 children aged 2 months to 59 months hospitalized during study period were screened for Severe Acute Malnutrition. 120 children diagnosed as Severe Acute Malnutrition were evaluated and data regarding determinants was collected, using questionnaire method. The following results were observed after evaluating the data collected from parents of children diagnosed as Severe Acute Malnutrition.

TABLE 1- PREVALENCE OF SEVERE ACUTE MALNUTRITION (SAM) IN HOSPITALIZED CHILDREN

SAM / NO SAM	NO. OF CHILDREN(N)	PERCENTAGE (%)
SAM	120	8.6%
NO SAM	1270	91.4%
TOTAL	1390	100%

Among total 1390 children aged 2 months to 59 months admitted during study period, 120 children (8.6%) were diagnosed as SAM. Hence prevalence of SAM was found to be 8.6%.



In our study among 120 children of SAM, 103(85.8%) children were underweight, 100 (83.3%) children were wasted, 71 (59.2%) were stunted. Pedal oedema was seen in 33 (27.5%) children.

Among 120 children enrolled, majority(90%) of children were below 2 years of age, remaining 10%were more than 2years of age. 55(45.8%)were female and 65(54.2%) were male. 71.6% belong to rural area and 28.4% belong to urban area.113(94%) were Hindu by religion and 7(6%) were Muslim. Most of the children belonged to upper lower class (71.7%) followed by lower middle class (22.5%) as per modified Kuppuswamy socioeconomic scale. When maternal education was taken into account, 35%were educated up to middle school (class 5^{th}), 20.8% were illiterate, 20% educated upto primary school, 15.8% were educated upto high school, 5.8% were studied upto higher secondary and only 2.5% mothers were graduated.

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Table 2- DEMOGRAPHIC DETAILS AND SAM PARAMETERS

VARIABLES	FREQUENCY (N)	PERCENTAGE (%)
AGE GROUP-		
2-6 months	**15**	**12.5%**
6-12 months	**52**	**43.3%**
13-24 months	**41**	**34.1%**
25-36 months	**08**	**6.6%**
37-60 months	**04**	**3.3%**
GENDER		
Male	**65**	**54.2%**
Female	**55**	**45.8%**
RURAL/URBAN		
RURAL	**86**	**71.6%**
URBAN	**34**	**28.4%**
RELIGION		
Hindu	**113**	**94.1%**
Muslim	**07**	**5.8%**
KUPPUSWAMY SCALE		
Upper Class	**00**	**00**
Upper Middle	**02**	**1.6%**
Lower Middle	**27**	**22.5%**
Upper Lower	**86**	**71.7%**
Lower	**05**	**4.2%**
SAM PARAMETERS		
Underweight	**103**	**85.8%**
Wasting	**100**	**83.3%**
Stunting	**71**	**59.2%**
Pedal oedema	**87**	**72.5%**

30 (25%) children were preterm delivery, 102 (85%) children were institutional delivery. 54(45%) children had normal birth weight while 49(40.8%), 14(11.7%) and 3(2.5%)children were low birth weight, very low birth weight and extremely low birth weight respectively. 22(18.3%) children had history of SNCU admission. Only 30(25%) children had history of previous hospitalization and 22(18.3%) children had fallen ill repeatedly.

Most of the children were of second order 53(44.2%).More than half of the children, 63(52.5%) children belonged to joint family, 54(45%) of children belonged to nuclear family and only 3(2.5%) children belonged to single parent.

79(65.8%) children lived in kachcha house; proper hygienic sanitary facility was seen in only 67 (55.8%) families and 60 (50%) families were having protected source of drinking water.

Both parents were working in 18(15%) cases while in rest of 102(85%) cases, only single parent was working. Caretakers of 104(86.6%) children washed their hands regularly after toilet use and before preparing food for children.

Majority of mothers (90%) were registered at Anganwadi center and 73 (60.8%) mothers had attended ANC 2-4 times. Complete immunization was seen in 82 (68.3%) of the children. Majority of children 107(90%) had received colostrum and only 12(10 %) children had received pre-lacteal feed. Exclusive breast feed was received by 84 (70%) children and only 55 (45.8%) children were weaned at proper time. 36 children (30%) were bottle feed once or more in their life and 25 (20%) children were on mixed diet. 63(52.5%) children consume mainly cereal based diet, 33(27.5%) children consumed milk, 11(9.2%) children consumed packaged food (sweet), and 08(6.7%) children consume salty packaged food. The mortality rate among 120 Severe Acute Malnourished children was found to be 3.3%.

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Table 3- DETERMINANTS OF SAM

VARIABLES	FREQUENCY (N)	PERCENTAGE (%)
MATERNAL EDUCATION		
Illiterate	**25**	**20.8%**
Primary School	**24**	**20%**
Middle School	**42**	**35%**
High school	**19**	**15.8%**
Higher Secondary	**07**	**5.8%**
Graduate	**03**	**2.5%**
PLACE OF DELIVERY		
Home Delivered	**18**	**15%**
Institutional	**102**	**85%**
TERM/PRETERM		
Term	**30**	**25%**
Preterm	**90**	**75%**
BIRTH WEIGHT		
<1 KG	**03**	**2.5%**
1-1.5 KG	**14**	**11.7%**
1.5-2.5 KG	**49**	**40.8%**
>2.5 KG	**54**	**45%**
IMMUNIZATION STATUS		
Complete	**82**	**68.3%**
Partial	**26**	**21.7%**
None	**12**	**10%**
PREVIOUS HOSPITALIZATION		
Yes	**32**	**26.7%**
No	**88**	**73.3%**
HOUSING CONDITION		
Kachcha house	**79**	**65.8%**
Pucca house	**41**	**34.2%**
SANITARY FACILITY		
Sanitary Latrine	**67**	**55.8%**
Open Field	**49**	**40.8%**
Community Based	**04**	**3.4%**
HAND HYGIENE		
YES	**104**	**86.6%**
NO	**16**	**13.4%**
ANGAN-WADI REGISTRATION		
YES	**107**	**89.2%**
NO	**13**	**10.8%**
EXCLUSIVE BREAST FEEDING		
YES	**84**	**70%**
NO	**36**	**30%**
EXTENDED EXCLUSIVE BREAST FEEDING		
Upto 6 months	**55**	**45.8%**
6-12 months	**50**	**41.7%**
12-24 months	**14**	**11.7%**
>24 months	**01**	**0.8%**

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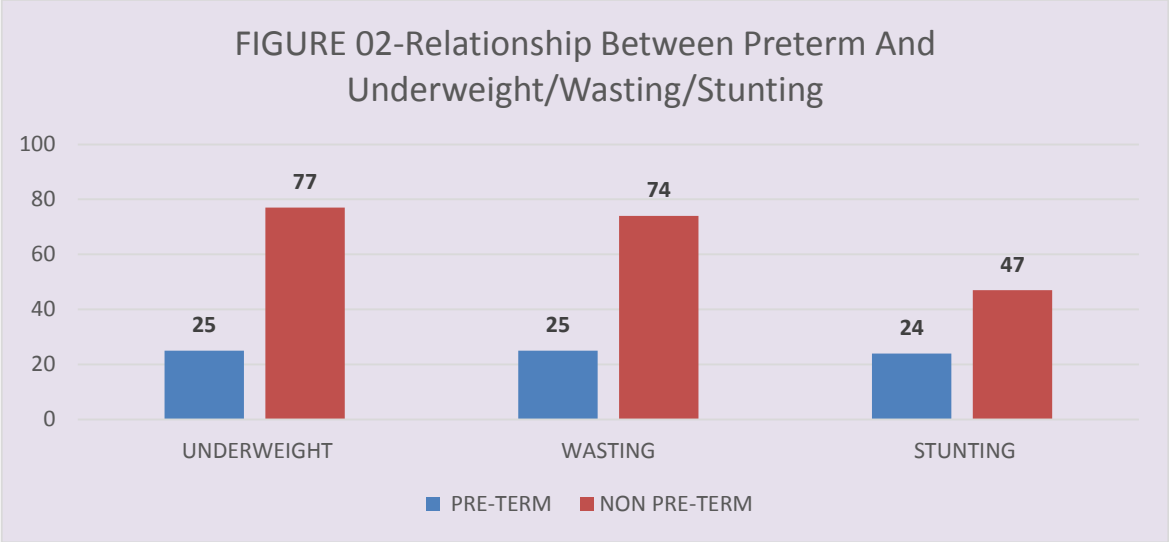
Table4- Relationship between Preterm and Underweight/Wasting/Stunting

	UNDERWEIGHT		WASTING		STUNTING	
PRETERM	**NO**	**YES**	**NO**	**YES**	**NO**	**YES**
YES	04	26	04	26	6	24
NO	13	77	16	74	43	47
TOTAL	17	103	20	100	49	71
P-VALUE	**0.917**		**0.798**		**0.007**	



In consideration of relationship between preterm child and underweight, wasting and stunting, only stunting was statistically significantly correlated with preterm delivery (p value < 0.05). While the relation between preterm delivery and underweight (p value >0.05) and wasting (p value >0.05) were not statistically significant.

Table5- Relationship between Birth Weight and Underweight /Wasting /Stunting

BIRTH WEIGHT	**UNDERWEIGHT**		**WASTING**		**STUNTING**	
	YES	**NO**	**YES**	**NO**	**YES**	**NO**
<1 kg	02	01	02	01	01	02
1-1.5 kg	13	01	10	04	10	04
1.5-2.5 kg	42	07	43	06	33	16
>2.5 kg	46	08	45	09	27	27
Total	103	17	100	20	71	49
P value	**0.137**		**0.111**		**0.103**	

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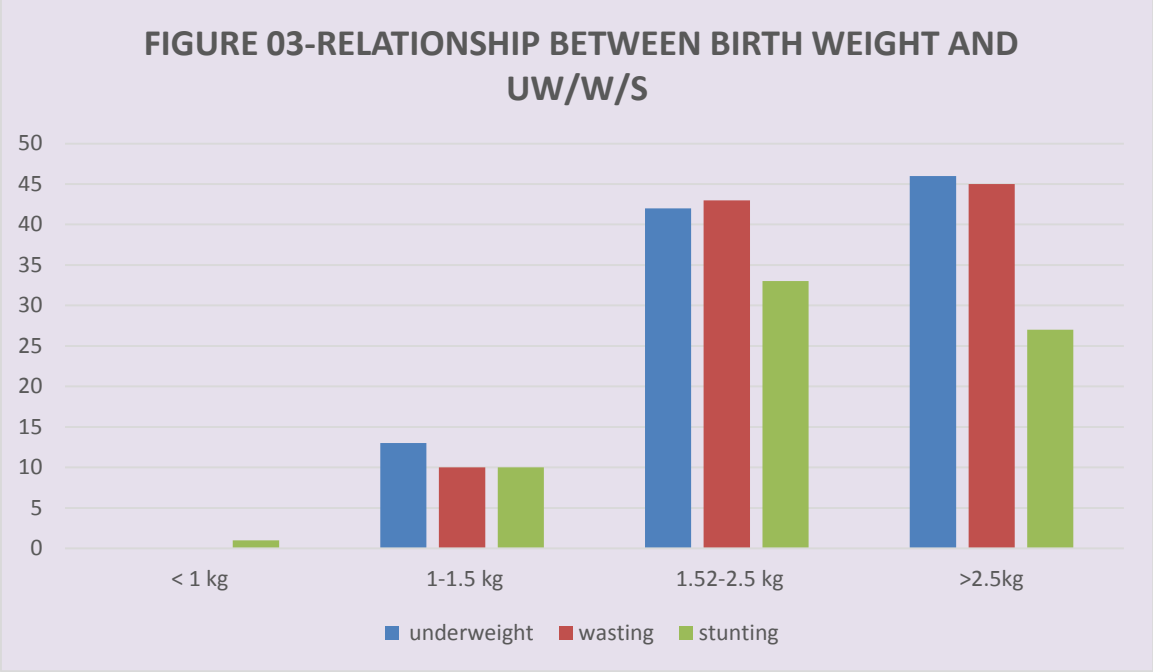

The above table shows relationship between birth weight and underweight, wasting and stunting. It shows insignificant p-value for underweight (p value-0.137), wasting (0.111) and stunting (0.103).

4. DISCUSSION

In this study, we screened a total of 1390 among hospitalized children aged 2mo -59mo to estimate the prevalence of SAM. In our study the prevalence of SAM was 8.6%. The prevalence was higher than prevalence of SAM in India (7.7%) and Madhya Pradesh (6.5%). **Pravati Jena et al**[4]reported prevalence of SAM as 2.8%, which was lesser than even the prevalence in general population whereas **Alka Mathur et al**[5] found 18.6% prevalence of SAM in their study.

In our study, 90% of children were less than 2 years of age which is similar to the study conducted by **Alka Mathur et al**[5] (2017). The prevalence in their study was 18.3 %. Among SAM children 80% of children were below two years of age.

Among SAM children 55(54.2%) children were male and 65(45.8%) children were female.94% of children were Hindu.71.6% children belonged to rural area.

In the present study, 27.5% were oedematous at the time of presentation and classified as kwashiorkor SAM and remaining were marasmic SAM, as also reported by **Rakesh Kumar et al** [6](prevalence 27%).

Underweight was seen in 104(85.6%) children, wasting was seen in 100(83.3%) children and stunting was seen in 71(59.2%) children, while **Alka Mathur et al** [5] reported underweight, wasting and stunting in 50.4%, 33.5%and44.6% of children respectively. In similar study by**Abel Gebre et al** [7], 24.8% were underweight, 16.2 % were wasted and 43.15% were stunted.

In the present study, 75.9%were from low socioeconomic status. In the study by **Pravati Jena et al** [4] 82.2% of SAM children were of low socioeconomic status.

In the present study 25(20.8%) mothers were illiterate. This is in accordance to study by **Dhrubajyoti et al**[8] (2012) ,where 31.9% mothers were illiterate.

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In the present study 79(65.8%) families were residing in kachcha house. Similar results were observed in the study of **Ravi Pachori et al [9]** where prevalence of kachcha house was found to be 65.2%.

In the present study, tap water as a source of drinking water was used by 60(50%) families. In the study conducted by **Abel Ghebre et al**[7] similar results were seen 51.2% have protected source (tap water) of drinking water.

In our study 68.3% children were completely immunized, 21.7% were partially immunized and 10% were not immunized at all. Similar results were reported by **Yasir Mehmood et al [10]** where 58% of children were completely immunized, 28 % were partially and 14% of children were not immunized at all. 66(55%) children were of low birth weight. Similar results were seen in study conducted by **Sam M David et al [11]** at Vellore, Southern India where 50% of children were less than 2.5kg at birth.

In the present study, most of the children 53(44.2%) children belonged to 2nd birth order followed by 1st birth order in 35(29.2%) children, 3rd birth order in 20(16.7%) children rest of the children had higher birth order. In the study conducted by **Monsurul Hoq et al** [12] (2019) first order children were 15.4% and rest were of higher birth order. Similar results for second birth order were seen in the study conducted by **Samundeswari et al[13]** where maximum birth order 47.8% were first order followed by second 44.4% and only 7.8% belongs to third order.

In the present study 102(85%) children were institutional delivery and 18(15%) children were home delivered. In the community-based study by **Abel Ghebre et al[7]** reported 57.5% of deliveries were at home and 42.5% were delivered at institution.

In our study the 30(25%) children were preterm (<37 weeks gestational age) delivered. In the study of **Swaathi B[14]** low prevalence of preterm deliveries (13%) was seen.

In the present study, the Antenatal checkup was nil among 10(8.3%) mothers of SAM children. A high prevalence of low attendance (41.6%) at ANC was seen in the study of **AB Ayana et al[15]**.

In our study the low prevalence of children receiving pre-lacteal feed was seen. In the study conducted by **Abel Gebre et al[7]** at northeast Ethiopian region found high prevalence upto 41.9 % of pre-lacteal feeding practices.

In our study the colostrum feed was received by 107(89.2%) children of SAM. In the study conducted by **Swaathi B[14]**, colostrum was received by 66% children, lesser than our study.

Prevalence of exclusive breast feeding in our study was seen in 84(70%) children. Similar prevalence, around 77.8% was found in the study conducted by **Semhal Getachew et al [16]** at PICU of Ethiopian hospital.

In our study, the exclusive breast feed beyond 6 months of age were seen in 65(54.2%) children. In the study by **Reddy et al[17]** weaning started by <4 months of age in 61.5% of children, at 6 month in 55.3% and > 6 month in 54.6% of children.

Family members of 104(86.6%) children followed hand washing practices after toilet or before preparing feed. **Ahmed Tahir Ahmed et al [18]** also found approximately similar results as 78% of family maintaining proper hand hygiene.

The prevalence of SNCU admission was 18.3% among SAM children. According to study by **Swaathi B [14]** the prevalence of SNCU admission was 34% which was somewhat higher than our study.

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In the present study, 04(3.3%) children expired during treatment. Similar results were seen in study conducted by **Swaathi B**[14] where mortality among SAM children were found to be 3%. In a study conducted by **Asif Nadeem Jamil et al.,** [19] 8.4% mortality seen in SAM children.

5. CONCLUSION

The prevalence of Severe Acute Malnutrition was 8.6% in Bundelkhand region of Madhya Pradesh, among hospitalized under 5 children. The determinants like less sanitary facility, low literacy rate among mothers, high birth order, less attendance at aangan-wadi centre, extended exclusive breast feed, poor immunization coverage were seen most of SAM children.

Weaning should be started at appropriate time and proper counselling about complimentary feeding should be provided to all lactating mothers. More and more aangan-wadi centres should be strengthened for improving immunization coverage. More emphasis should be given on proper sanitation. Open field defecation practice should be completely abolished and sanitary latrine must be provided in every household.

Author's Contribution: SH, SKS: literature review and revised the article. AKJ, AJ: Concept, literature review and revising the article critically for important intellectual content AC: Acquisition and interpretation of data, data analysis, drafting the article, and literature review. RA: Data acquisition and drafting the article. RK: Data acquisition and drafting the article. All the authors approved the final manuscript.

Conflict of interest: None

Ethical Clearance: Institutional Ethical Committee, Bundelkhand medical college, Sagar; Approval Letter Number IECBMC/2021/40, dated 07/10/2021.

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