International Journal of Community Medicine and Public Health
Phadke MA et al. Int J Community Med Public Health. 2026 July;13(7):4060-4062
http://www.ijcmph.com
pISSN 2394-6032 | eISSN 2394-6040
DOI: https://dx.doi.org/10.18203/2394-6040.ijcmph20261851

Letter to the Editor

Double burden index – measuring complex facets of malnutrition

Sir,

For over the past three years, world has been facing many challenges regarding various aspects of malnutrition in children under 5 years. Similar are the experiences from Maharashtra. National Family Health Survey (NFHS) 4 and 5 data and other surveys have shown conflicting results on various subgroups of malnutrition, like stagnation of wasting, stunting and underweight decrease in some areas but increase in obesity in some population groups (Table 1).[1,2]

Despite increasing research on the double burden of malnutrition (DBM) i.e., coexisting over- and under nutrition, there is no global consensus on DBM definitions. Existing DBM definitions vary widely. Putting structure to possible definitions may facilitate selection of fit-for-purpose indicators to meet public health priorities.[3]

WHO refers to DBM as "characterized by the coexistence of undernutrition (stunting and wasting) along with overweight, obesity within individuals, households and populations, and across the life-course".[4]

Table 1: Maharashtra - NFHS data on children under 5 years.

Survey	Wasting (%)	Severe wasting (%)	Stunting (%)	Underweight (%)	Obesity (%)
NFHS – 4, 2015-16	25.6	9.4	34.4	36	1.9
NFHS – 5, 2019-20	25.6	10.9	35.2	36	4.1

OVERLAP AND DUPLICATION

The existing nutritional classification based on anthropometry, one cannot get an exact number of normal children in a population. Many children have more than one deficit. Multiple anthropometric deficits with overlaps obfuscate the numbers as well as clinical picture. The result could be same children being counted as stunted, wasted, underweight giving higher numbers than reality. At the same time undernutrition combined with overnutrition /obesity adds different dimension to the data.

Many issues in the field like technical problems with manipulation, editing and also inability to visualize and get real time nutritional status of a child or a given population sample is the field experience. For a given baby, parents would like to know if their child is normal or otherwise, an idea about the state of nutrition of their baby and further corrective steps if needed. In addition to all these, COVID-19 resulted in unique nutrition challenges. Job losses, food shortage, non - availability of greens, increased use of ultra-processed "Juncs" food, early marriages have resulted in amplifying malnutrition in different ways and the impact is long lasting. Climate change is adding fuel to the fire. Management of these children is critical. Unless a proper categorization of the nutritional status of the baby is done, proper treatment cannot be initiated. Stunted child initiates beginning of life long origins of Non communicable diseases (NCD). Hence, the need was felt for new formula for classification of double burden.

This prompted us to devise a classification of malnutrition and an Index that will eliminate such difficulties. This is for the first time that such an attempt is made. It has implications for public health policy as also for an individual baby. It is called the double burden index (DBI) - PNGR (initials of the scientists).

It classifies malnutrition in the following 9 categories:

Normal children

No anthropometric deficit using WHO growth charts for height and weight. Weight for age >-2SD, weight for height >-2SD, height for age >-2SD and weight for height <+2SD,

Wasted children

Weight for height <-2SD.

Wasted + underweight

Weight for height <-2SD, weight for age <-2SD.

Wasted + stunted + underweight

Weight for height <-2SD, height for age <- 2SD, weight for age <-2SD.

Stunted + underweight

Height for age <-2SD, weight for age <-2SD.

Stunted

Height for age <-2SD.

Underweight

Weight for age <-2SD.

Stunted + over weight/obese

Height for age <-2SD, weight for height >+2SD.

Overweight/obese

Weight for height >+2SD.

Total 100, DBI index 100-A or B to I %.

Children who are wasted should be given SAM protocol for management. If a child has stunting, one may need to treat rickets, zinc deficiency, chronic poor nutrition, WASH conditions, hypothyroid, and skeletal genetic conditions. Mixed deficits need a combined approach. Children in D category will need urgent attention. Similarly, children in category H i.e. stunting and obesity will require a separate approach, also keeping early life origins of adult metabolic diseases in mind. 'Wast' i.e. wasting with stunting is always associated with underweight. Hence no separate group given to 'Wast'.

DIAGRAMMATIC FORMULA OF DBI

Svedberg and Nandy devised CIAP- composite index of anthropometric failure and triple burden was added by Umranikar, Joshi, and Phadke (Figure 1).[5-7]

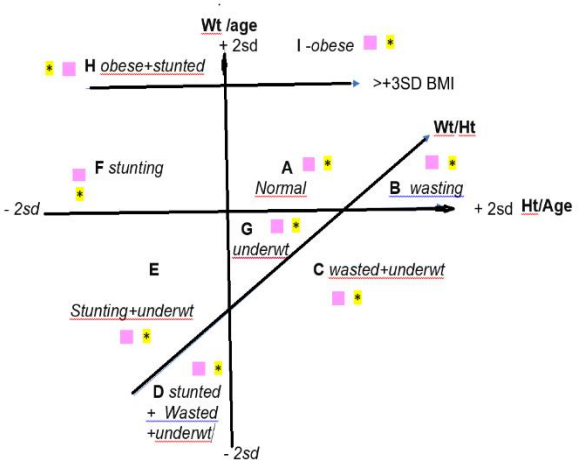

Figure 1: Diagrammatic formula of DBI.

OPERATIONAL RELEVANCE AT FIELD LEVEL

Management SOP for children identified into various groups using DBI. When a baby has been brought to the health facility like Anganwadi, OPD or IPD of pediatric ward, immunization clinic, note the following: Birth date, weight of the baby, length for babies below 2 years, height for babies above 2 years.

Check these measurements on WHO growth charts, weight for age, weight for height, height for age, for boys and girls separately and upto 2 years and above 2 years. Know the nutritional status of the baby based on anthropometric measurements into gr A to I. Alternatively enter these measurements into the software link on your mobile pH.

You will get the categorization of baby from A to I. You can calculate DBI of your Anganwadi/ward children for a specific period. Having known the category of the baby, manage as follows.

Group A - normal children

Growth monitoring, nutrition counselling, BF, complementary feeding, deworm after 1 year, vitamin D 400 IU till one-year, biweekly iron 20 mg after six months of age, and immunization and ECD.

Group B – wasted children

Appetite test pass and no danger signs– community management, RUTF/EDNF, triple convergence AAA/VCDC follow up. Appetite test fail, medical illness, oedema or IMNCI danger signs– admit in NRC, F 75 then transition to F100, avoid IV fluids, no blood transfusion, diuretics. Give antibiotics, iron only after one week. Manage complications low sugar, hypothermia, infection electrolyte, energy dense food as per GOI guidelines SAM management.

Group C – wasted and underweight

Manage as above, can become severely wasted with one illness. Special emphasis on MAM at risk (weight for age less than 3 SD).

Group D – wasted plus stunted plus underweight

Highest risk, NRC management especially with danger signs /severely underweight WAZ <-3.

Group E – stunted and underweight

Community management, emphasis on minimum acceptable diet (minimum dietary diversity plus minimum meal frequency) micronutrients, WASH, Deworm, and protein enriched food -dals, milk, eggs. Start iron, vitamin D, Zn, calcium early. Investigate for anemia, rickets, nutritional, skeletal, thyroid, endocrine causes

Group F – stunted

Stunting after two years irreversible so diet plus micronutrients very imp in first 1000 days. Diet should be protein rich but not energy dense- dal, milk, and eggs.

Group G – underweight

Below six months WAZ <-2 high risk for poor growth and development. Emphasize Breast feeding, supplementary suckling

After 6 months of life emphasize complementary feeding 4 food groups, 4 colours 4 times a day in addition to breast milk and micronutrients.

Group H – stunted plus overweight

Genetic/endocrine cause or DOHAD. Micronutrients/diet/ less screen time, more activity and metabolic investigations

Group I – obese

Life style modification, familial screening, diet, physical activity, and diet modifications.

CONCLUSION

The unique and innovative tool will help policy makers to get no. of normal babies and burden of malnutrition in the community. It will help health workers to treatment protocol and better management. It is expected that, every child attending any health facility is subjected to anthropometric measurements routinely. Through the DBI index, it is reiterated that anthropometric measurements like weight and height/length are necessary. Normally, these measurements are plotted or checked on WHO growth charts. Through the DBI index, these measurements are converted to nutritional assessment i.e. A too I on DBI index. This gives an idea about nutritional status of the child single deficit, multiple deficits etc. From public health view point it gives the no. of normal children in the community and an idea about the double burden i.e. undernutrition and over nutrition.

ACKNOWLEDGEMENTS

Authors would like to acknowledge the help and support of pediatricians from IAP, Mumbai, COMHAD, Maharashtra.

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Cite this article as: Phadke MA, Nair R, Menon P, Giri P. Double burden index – measuring complex facets of malnutrition. Int J Community Med Public Health 2026;13:4060-2.