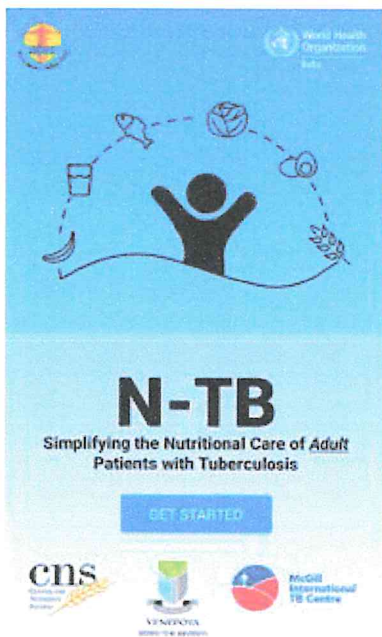


## N-TB, an app for nutritional assessment & counselling of patients with tuberculosis

On World TB Day (24 March), the Center for Nutrition Studies, Yenepoya University, Mangalore in association with McGill International TB Centre, Montreal is pleased to announce the public release of **N-TB**, an android mobile based application for the nutritional assessment and counselling of adult patients with TB. This app, endorsed by the Revised National Tuberculosis Control Programme and WHO India, was included in the new initiatives unveiled by Prime Minister Narendra Modi during the Delhi End TB Summit on March 13<sup>th</sup> 2018.

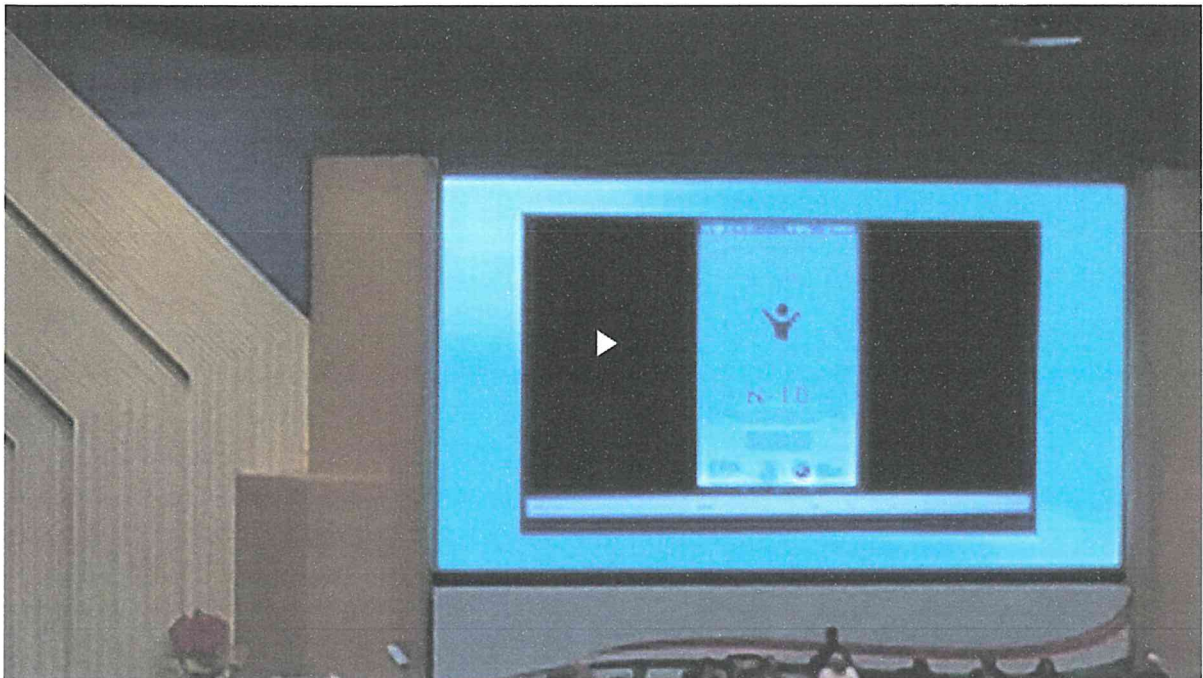


TB often results in significant weight loss, which can exacerbate underlying undernutrition. Studies in India have shown that 50% of adult men and women with TB weigh below 42 kg and 38 kg respectively. Studies in rural India have also shown life-threatening levels of low BMI. Undernutrition in TB patients has been shown to be a consistent risk factor for death, and this is important in a country like India where current levels of TB mortality are high with 423,000 deaths due to TB. Undernourished patients are also at higher risk of serious side-effects of drugs, poor absorption of drugs, reduced ability to return to work, and recurrence of disease after cure.

Undernutrition in TB patients is now considered a medical condition like co-existing diabetes, or HIV infection. WHO recommends that nutritional assessment, counselling and support should be considered an integral part of TB care. The

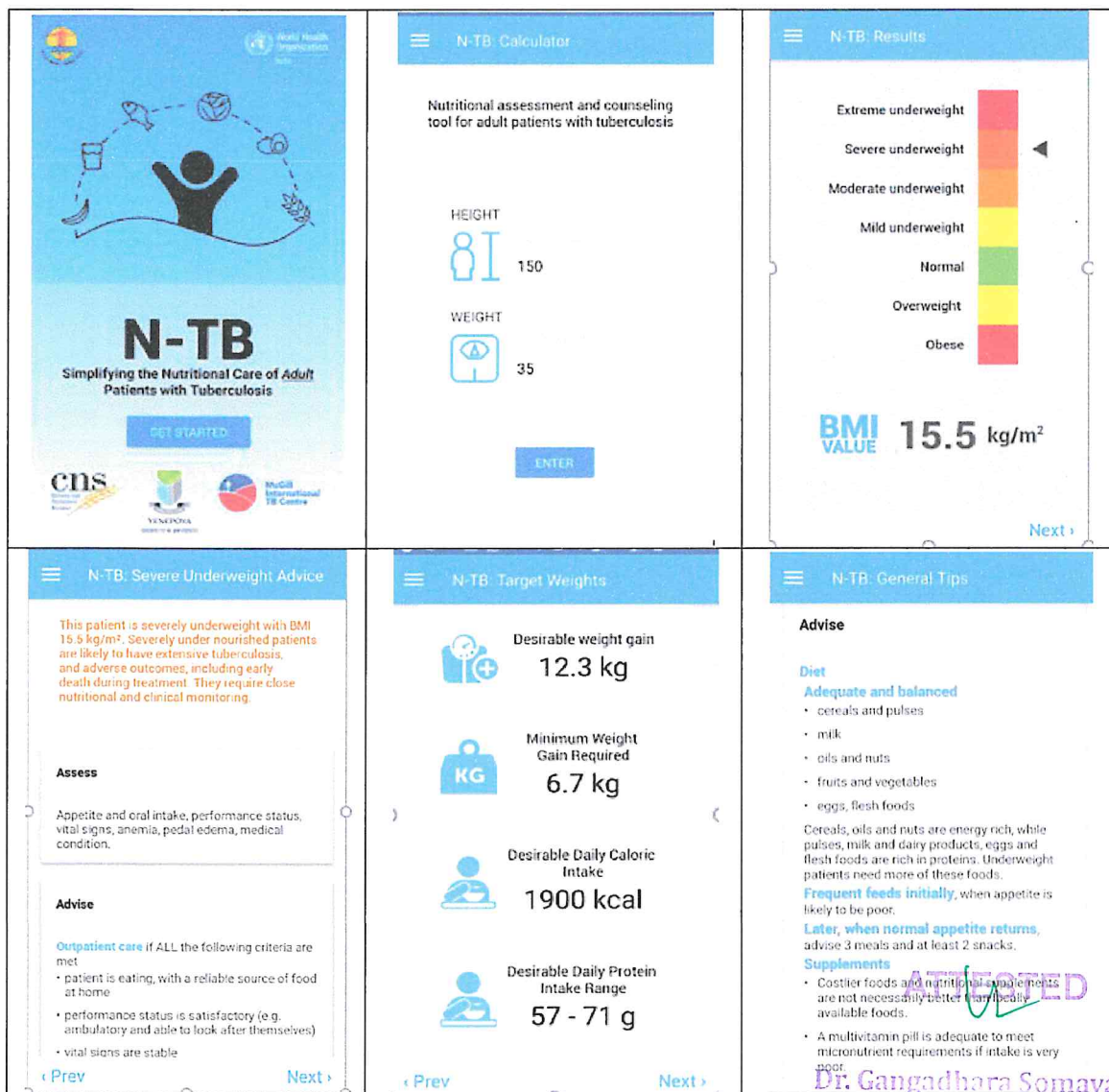
RNTCP released a Guidance document on Nutritional Care and Support for patients with tuberculosis in India in 2017, one of the first countries to do so. This year has seen the launch of nutritional support initiatives in the form of food rations by many states. The Union Government also announced a direct benefit transfer of Rs. 500 per month, to be made operational from April 2018, to enable nutritional support for TB patients.

All these initiatives will require healthcare providers to be skilled in nutritional assessment and counselling. The **N-TB** is the first of its kind app for healthcare providers. It enables the classification of the nutritional status of the patient by calculating the body mass index (BMI). If the BMI is very low, it red-flags this and provides an overview of management of severe undernutrition. The app also provides the weight gain required during treatment to achieve a desirable weight, and the recommended daily caloric and protein intake (screen shots on the next page). It has counselling tips on diet with an emphasis on the value of locally available foods in contrast to costly nutritional supplements, activity and lifestyle.



The launch of N TB App Dr. Anurag Bhargava Ph: 82774 08009/ 82967 43154, email: [anurag.bhargava@yenepoya.edu.in](mailto:anurag.bhargava@yenepoya.edu.in)

Dr. Madhavi Bhargava Ph: 8277357464; email: [madhavi.bhargava@yenepoya.edu.in](mailto:madhavi.bhargava@yenepoya.edu.in)

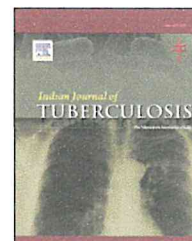


Screenshots of the application

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## Original article

# N-TB: A mobile-based application to simplify nutritional assessment, counseling and care of patients with tuberculosis in India

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## ABSTRACT

Undernutrition is the most prevalent comorbidity in patients with tuberculosis (TB) in India. Undernutrition is often severe and results in higher risk of death, drug toxicity during treatment, poor functional status at end of treatment and a higher risk of relapse after successful treatment. A World Health Organization guideline has recommended nutritional assessment, counseling, and care as integral parts of TB care. The Revised National Tuberculosis Control Programme has recognized undernutrition as a significant comorbidity, released a guidance document for improving nutritional care and support, and launched a scheme for direct bank transfer of monthly cash benefit to TB patients. However, there are gaps at the provider level on nutritional assessment, due to challenges in calculation and interpretation of body mass index (BMI). A mobile based application has been developed for use in the programme, which makes estimation of BMI possible, classifies the severity of undernutrition, suggests triage and clinical actions based on the BMI, indicates desirable body weight corresponding to a BMI of 21 kg/m<sup>2</sup>, and the daily caloric and protein intake for underweight patients with active TB. The app also provides tips for dietary counseling for TB patients, information on the major food groups, emphasizes an adequate and balanced diet from locally available foods for nutritional recovery of TB patients.

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In the pre-chemotherapy era, a nutritious high protein diet was an essential component in the sanatorium-based management of tuberculosis (TB). However, the success of home-based chemotherapy and the closure of sanatoria led to

nutrition falling off the radar of TB programmes. In many high-TB burden countries like India, “consumption” is still an apt descriptor for TB which literally means ‘wasting away’. In a cohort of patients with pulmonary TB (PTB) in central India,

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undernutrition was nearly universal.<sup>1</sup> Adult men and women had median body mass indices (BMIs) of 16 kg/m<sup>2</sup> and 15 kg/m<sup>2</sup>, and a BMI as low as 10 kg/m<sup>2</sup> was also documented.<sup>1</sup> Data on weights of adult patients from India's Revised National Tuberculosis Control Programme (RNTCP) also revealed severe undernutrition with median weights of 42 kg and 38 kg in men and women respectively.<sup>2</sup> In the absence of nutritional support, undernutrition persists even at the end of therapy.<sup>1,3</sup>

Undernutrition in patients with TB has numerous implications such as increasing the risk mortality by 2–4-fold.<sup>1,4</sup> Low BMI is a risk factor for drug-induced hepatotoxicity and drug malabsorption.<sup>5,6</sup> Low baseline weight and inadequate weight gain during treatment are risk factors for relapse.<sup>7</sup> Poor nutritional recovery affects the performance status and return to active life following cure.

The high prevalence and serious implications of undernutrition in patients with TB, led the World Health Organization (WHO) to frame a guideline for nutritional care and support of TB patients.<sup>8</sup> It emphasized the need for nutritional screening, assessment and management as key components to the TB care cascade. Further, it also alluded to an adequate diet being essential for proper health for all, including TB patients.<sup>8</sup>

India, the country with the largest global burden of TB, where undernutrition is a co-epidemic, has seen recent policy initiatives in addressing the TB-undernutrition link. A guidance document, which is a context-specific adaptation of the WHO guideline, has been formulated.<sup>9</sup> Undernutrition has now been regarded as co-morbidity and a key driver of the TB epidemic by the programme, in addition to HIV and diabetes.<sup>10</sup> The Government of India has also announced a direct benefit transfer (DBT) scheme of 500 Indian rupees per month for TB patients to ensure access to a nutritious diet under the *Nikshay Poshan Yojana*.<sup>11</sup> These initiatives in India are aligned with the priorities of patient-centered care and management of co-morbidities of the END TB strategy.

Nutritional assessment, counseling and care in patients with TB are all linked activities. Nutritional assessment requires measurement of height, weight, calculation of BMI and classification of nutritional status based on BMI. This should be followed by nutritional counseling emphasizing an adequate and balanced diet with focus on locally available foods and patient preferences. Provision of food/supplements occurs in many programmes, and their choice is guided by scientific rationale, cultural acceptability, operational feasibility and cost considerations.

Implementing of nutritional assessment and support in programmatic setting for frontline care providers has numerous challenges. For example, in India, heights were not included in routine patient data till the recent past. Currently heights are being measured as per the new TB card but are not being translated into BMI values and/or categories. In an ongoing operational research study we found that primary care providers were unfamiliar with calculation of BMI and BMI-based nutritional classification of nutritional status.<sup>12</sup> As a result, they assessed nutritional status by variable and arbitrary weight-based cutoffs for underweight patients (35 kg or 40 kg). Ideally, nutritional assessment should lead to

clinical decisions relevant to patients and care providers. The recognition of high risk patients with severe undernutrition and their management is one such clinical action. Counseling on adequate intake of calories and proteins assumes knowledge of calorie and protein requirement for patients based on their nutritional status, which may be challenging for care providers.

## 1. N-TB app: an enabler for nutritional assessment, monitoring and counseling for frontline care providers of patients with tuberculosis

An android and iOS based application called N-TB has been developed to address some of these challenges in the domain of nutritional care of TB patients. It has been endorsed by the RNTCP and WHO (India).<sup>13</sup> The only input values required are height in cm and weight in kg of adult TB patients. Based on these input values it provides the following information (Fig. 1):

### 1.1. Nutritional assessment at diagnosis and follow up

It calculates the BMI and categorizes the patient into different color coded nutritional categories using WHO recommended cut-offs. It also mentions an extremely underweight category for those at or below a BMI of 14 kg/m<sup>2</sup>, which are at extremely high risk of adverse outcomes, including death.

The app gives an estimate of the desirable weight as a function of the height of the patient, defined as the weight corresponding to a BMI of 21 kg/m<sup>2</sup>, and the minimum acceptable weight corresponding to a BMI of 18.5 kg/m<sup>2</sup>. It also uses these weights to estimate the weight gain required in the patient to reach a desirable or minimum acceptable BMI, which can help assess adequacy of weight gain during follow up.

### 1.2. Triage for patients with severe acute malnutrition

The app provides a red-flag alert in case the BMI is less than 16 kg/m<sup>2</sup>, and indicates a requirement of hospital admission if there is coexisting poor performance status, pedal edema, and severe anemia. Any patient with a BMI less than 14 kg/m<sup>2</sup> also mandates admission. The app also provides an overview of the management of severe malnutrition in adults.

### 1.3. Counseling tips for an adequate and balanced diet

Furthermore, the app provides a recommended daily intake of calories for underweight patients based on the requirements of 40 kcal/kg of desirable body weight. To note here, the daily caloric intake is measured based on a sedentary lifestyle. It also recommends a daily protein intake of 1.2–1.5 g/kg of desirable body weight.<sup>9</sup> The app has information on major food groups, their caloric and protein values. It provides counseling tips on diet emphasizing locally available foods, clarifying many common misconceptions and myths.

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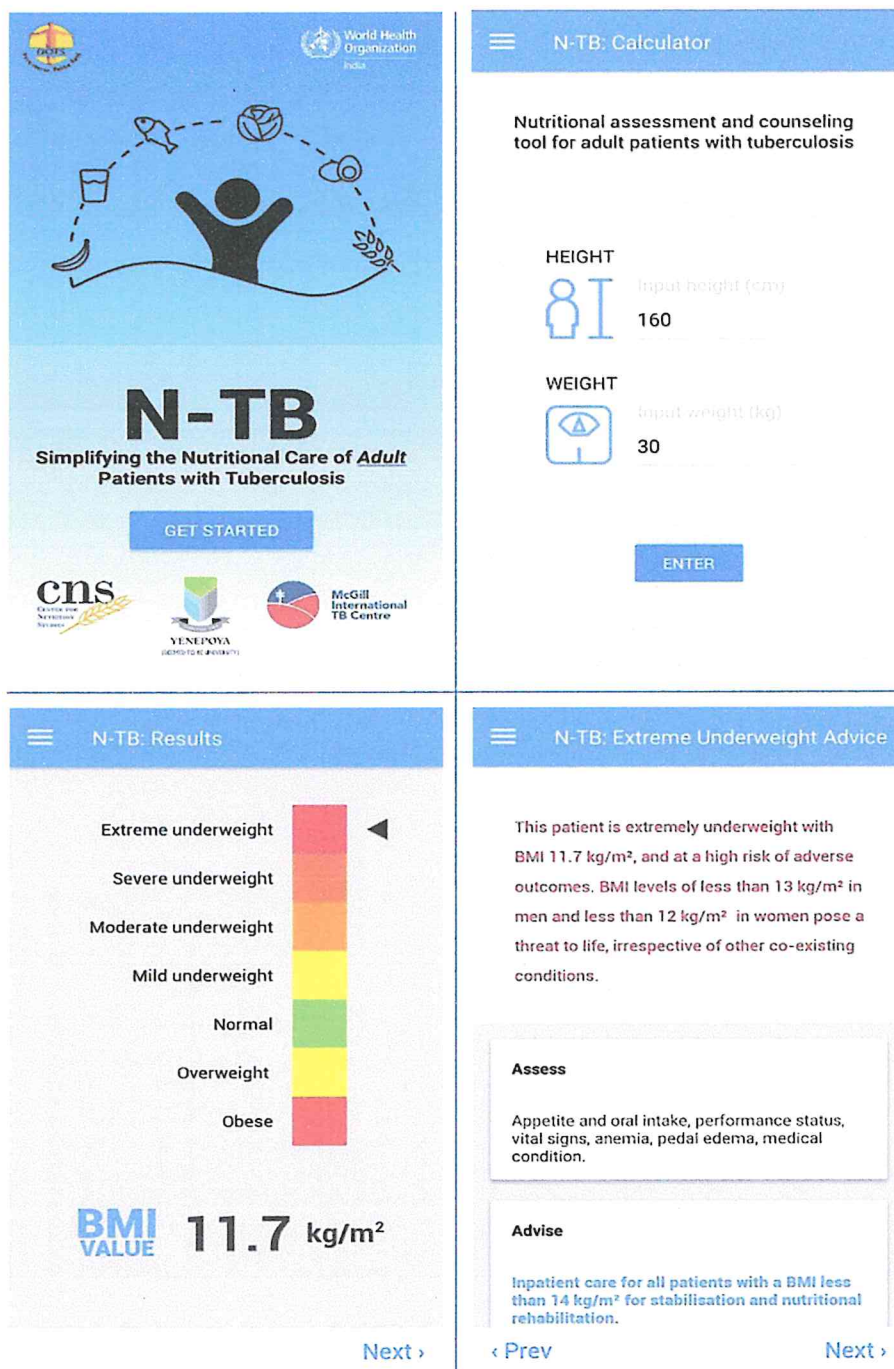


Fig. 1 – Screen shots of N-TB app.

Further development plans for the app include linking the outputs to customized meal plans, availability in other languages and a patient version with more graphic content. Operational research and field validation studies may lead to better understanding of its strengths and limitations as an operational tool at programmatic setting.

**Conflicts of interest**

The authors have none to declare.

**Acknowledgments**

The support of McGill International TB Center, Montreal, Canada, and Yenepoya (Deemed to be University), Mangalore, India for the development of this app is gratefully acknowledged. We wish to thank Dr. Madhukar Pai of McGill International TB Center and Dr. Prashant Upadhyaya for their valuable inputs. We also wish to thank Mr. Alain Cote (Expression Web Solutions, Montreal) and Mr. Arjun Khandelwal (Samanvay Foundation, Bangalore) for developing the app software.

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13. N-TB app [Internet]. *Play.google.com*; 2018. Available from: <https://play.google.com/store/apps/details?id=com.nexa.ntb>. Accessed July 2018.

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Dy. Director General  
Head, Central TB Division  
Project Director, RNTCP



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भारत सरकार  
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Ministry of Health & Family Welfare  
निर्माण भवन, नई दिल्ली - 110108  
Nirman Bhavan, New Delhi- 110 108

Date: 31.10.2018

Dear

**Sub: Utilization of N-TB mobile application for implementation of Guidance document on nutritional care & support for patients with TB in India – Reg.**

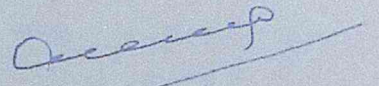
Gol is committed to ending TB by 2025, five years ahead of the Global Sustainable Development goals. In order to achieve this, it is important to address the social determinants of Health. Undernutrition is an established risk factor for progression of latent TB infection to active TB, increases the risk of severe disease, death, drug toxicity, drug malabsorption & relapse after cure and at the population level contributes to an estimated 55% of annual TB incidence in India. Moreover, TB leads to weight loss, wasting and worsening of nutritional status. Therefore, Undernutrition and tuberculosis (TB) have a bidirectional relationship.

Addressing undernutrition and providing nutritional support to households with TB patients would be key to achieving the Government of India's ambitious goal. In order to address this significant risk factor, the "Guidance document on nutritional care & support for patients with TB in India" was developed by Central TB Division and released on the occasion of World TB Day 2017.

In order to facilitate implementation of the technical aspects of the nutritional assessment and appropriate supplementation, the N-TB app has been developed by CTD with support of Center for Nutrition Studies, Yenepoya (Deemed to be University), WHO and McGill International TB centre. It is a tool for health care workers to calculate BMI of TB patients, know how to counsel patients and choose the food items as per their BMI to improve BMI while on treatment and later. It is available for download on Android devices - <https://play.google.com/store/apps/details?id=com.nexa.ntb> and iOS device (<https://itunes.apple.com/in/app/n-tb/id1402523153?mt=8>). The training materials which may be used for sensitizing the staff on this app are attached for reference.

You are requested to widely disseminate the information on this app and ensure that all the program staff install the application on their Android tablets and utilize the same in counselling of the patients.

Yours sincerely

  
(Dr K S Sachdeva)

Annexures: As mentioned above

To

State TB Officers (All States/UTs)


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PPS to JS (TB), MoHFW

District TB officers (All Districts of all States/UTs)

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# New App to Launch on World TB Day, Will Assess Nutrition & Provide Counselling to Patients

HEALTH WELLNESS Sania Dhirvani Mar 23, 2018 11:10 AM IST

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Representational Image. (Photo Credits: Jeshoots/pixabay)

The Yenepoya (Deemed to be University) in Mangalore and McGill International TB Centre are set to release an android-based app for tuberculosis patients on World Tuberculosis Day on March 24. The app endorsed by the Revised National Tuberculosis Control Programme and WHO India, was

included in the new initiatives unveiled during the End TB Summit recently held in New Delhi. The app called N-TB will let the user calculate his or her body mass index (BMI).

If the BMI is very low, the app will red-flag the fact and provide guidance on how to manage severe undernutrition. The app will help provide a treatment plan to achieve a desirable weight and will recommend the daily caloric and protein intake. It will also offer counselling tips on diet with an emphasis on the value of locally available foods in contrast to costly nutritional supplements, activity and lifestyle. The app can be downloaded for free on Google Play. The app is developed by Dr. Anurag Bhargava and his wife Dr. Madhavi Bhargava. Dr. Anurag said undernourished patients are at higher risk of serious side-effects from drugs, poor absorption of drugs, reduced ability to return to work and recurrence of disease after cure.

Tuberculosis often results in significant weight loss, which can aggravate underlying undernutrition. Studies in India have shown that 50% of adult men and women with tuberculosis weigh below 42 kg and 38 kg respectively. Studies have also shown that TB patients in rural India have life-threatening levels of low BMI. The app is important in a country like India because undernutrition in TB patients have been shown to be a consistent risk factor for death. The current levels of TB mortality in India are high with 423,000 deaths due to TB, said Dr Madhukar Pai, associate director, McGill International TB Centre.

The centre has announced a direct benefit transfer of Rs500 per month from April 2018 to enable nutritional support for TB patients. All these initiatives will require healthcare providers to be skilled in nutritional assessment and counselling, and the N-TB is the first-of-its-kind app for healthcare providers.

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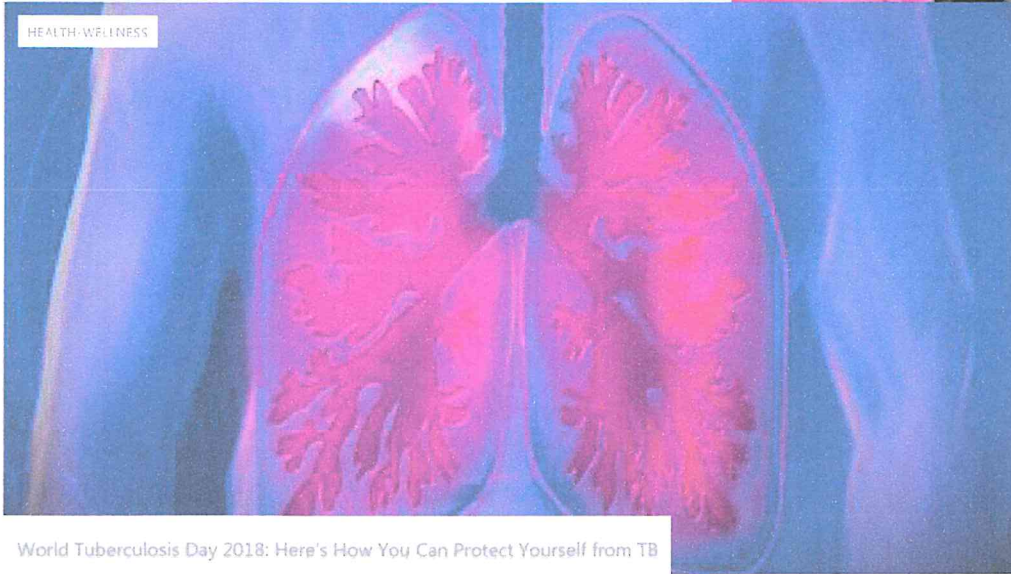




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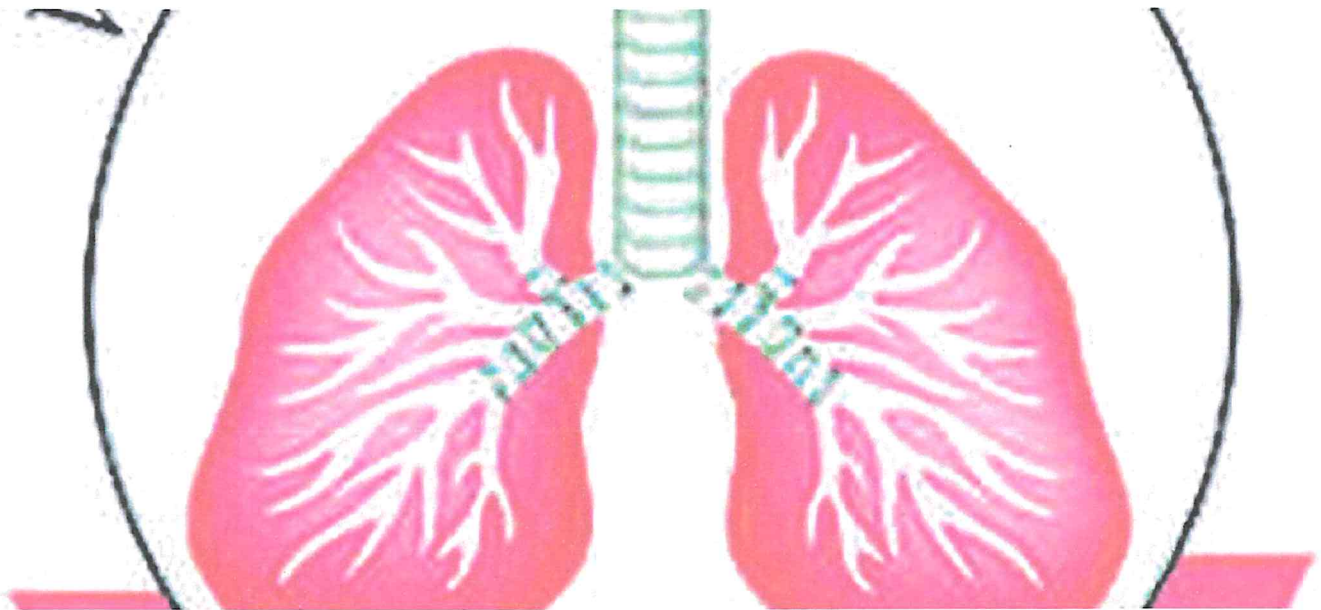
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# N-TB app to demystify nutrition for TB patients

PT JYOTHI DATTA



Allows healthcare workers to calculate the right BMI and nutrition levels

MUMBAI, MARCH 23

Under-nutrition brings with it the risk of death in a person with tuberculosis (TB). And this is the critical indicator that N-TB, a mobile phone-based nutrition assessment and counselling application is looking to address.

Weight is the indicator that is often monitored in treating TB, but height too, is critical in getting the actual picture, explains Anurag Bhargava, Professor of Medicine at Mangalore's Yenepoya Medical College. It may be obvious that a woman who is 30 kg is underweight. “But when you calculate that the BMI (Body Mass Index) is 11, that’s when the threat to life becomes clear,” he explains. And this becomes significant given the high levels of TB mortality, estimated at 4,23,000 deaths in India.

N-TB allows healthcare workers who handle TB patients calculate the right BMI and nutrition levels. The app will be launched on World TB Day (March 24).

 ATTESTED

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It is based on the Guidance Document on nutritional care and support for patients with tuberculosis in India that was released by the Revised National Tuberculosis Control Programme (RNTCP) last year. And while the Center for Nutrition Studies, Yenepoya University provided the content for the app, it was developed with technical support from McGill International TB Centre, Montreal.

## Demystifying diets

N-TB also helps demystify dietary counselling, says Bhargava, by helping to calculate the nutritional value of foods such as pulses and fruits. There is a misconception that the more expensive the food is, the better it is. Bananas, guavas and eggs, for instance, he says are good nutritional options.

Weightloss from TB can further aggravate underlying under-nutrition, says Bhargava, a seasoned TB researcher. And undernourished patients are at higher risk of serious side-effects from drugs, poor absorption of drugs, reduced ability to return to work, and recurrence of disease after cure.

## Govt support

The issue has also been touched upon in the Union Budget 2018 where ₹500 per month is being given to TB patients for nutritional support. This is to become operational from April. Last week the government further tightened the reporting of TB by making it mandatory for doctors and pharmacies treating or dispensing medicines respectively to notify the same with local health authorities, or face penalties including prison time.

Under-nutrition in TB patients is now considered a medical condition like co-existing diabetes, or HIV infection. And the World Health Organisation recommends that nutritional assessment, counselling and support be an integral part of TB care.

N-TB is endorsed by the RNTCP and the World Health Organisation (India), say the institutions who worked on it and Bhargava hopes that medical professionals and nurses in private hospitals also use the app while treating their TB patients. The app was among the new initiatives unveiled by Prime Minister Narendra Modi during the recently concluded TB Summit, they said.

Published on March 23, 2018

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**Lifestyle**

## World Tuberculosis Day 2018: Scientist develops New N-TB android app for patients

By: NH Bureau / 23 Mar '18 / 02:57 PM /


NEW DELHI : Doctors in Mangalore and McGill International TB Centre have come up with an android-based app for tuberculosis patients on World Tuberculosis Day to be observed on March 24. The application will let the user calculate his or her body mass index (BMI) and will provide a treatment plans, as well.

Dr. Anurag Bhargava, Dr Madhavi Bhargava and Dr Anurag has developed an android-based app for tuberculosis patients across the world. The Yenepoya (Deemed to be University) in Mangalore and McGill International TB Centre has decided to launch the app on 'World Tuberculosis Day' observed every year on March 24. Also, known as N-TB, this app will allow its user to calculate his or her body mass index (BMI).

For suppose, if the BMI is very low, the app will indicate red-flag and will provide guidance on how to manage severe under nutrition. The app will also offer a treatment plan to achieve a desirable weight and will suggest the daily caloric and protein intake. It

In addition, N-TB app will offers counselling tips on diet with an emphasis on the value of foods available in local market in difference to costly nutritional supplements, activity and lifestyle. This new application for tuberculosis patients can be downloaded for free on Google Play.

N-TB app was presented during the Delhi End TB Summit held recently and has been

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World Tuberculosis Day 2018: Scientist develops New N-TB android app for patients

certified by the Revised National Tuberculosis Control Programme and WHO India,

Dr Madhukar Pai, associate director, McGill International TB Centre said, "Tuberculosis often results in significant weight loss, which can exacerbate underlying under nutrition. Studies in India have shown that 50 per cent of adult men and women with tuberculosis weigh below 42 kg and 38 kg respectively. Studies in rural India have also shown that tuberculosis (TB) patients have life-threatening levels of low BMI.

Under nutrition in TB patients has been shown to be a consistent risk factor for death, and this is important in a country like India, where current levels of TB mortality are high with 423,000 deaths due to TB."

Developers of the application mentioned that under nourished patients are at higher risk of serious side-effects from drugs, poor absorption of drugs, reduced ability to return to work and recurrence of disease after cure.

Sources confirmed that the Centre has announced a direct benefit transfer of Rs 500 per month from April 2018 to enable nutritional support for TB patients. However, all these health care initiatives will have need of healthcare providers who are skilled in nutritional assessment and counselling. As of now, N-TB is the first-of-its-kind app for healthcare providers. Let's see, if the TB-patients find the app suitable and applicable.

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Dr. Gangadhara Somayaji KS  
Registrar  
Yenepoya (Deemed to be University)

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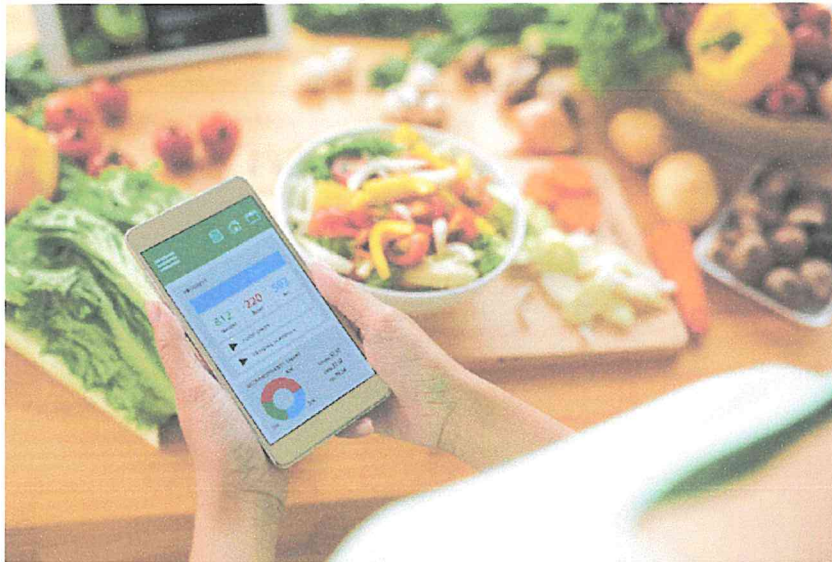
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### Mangaluru Professor develops nutrition app for TB patients

27 MAR, 2018



**Dr. Anurag Bhargava, Professor, Yenepoya University, Mangaluru has developed N-TB app for patients suffering from tuberculosis to provide them with nutritional information.**

N- TB asks for specific details such as the height and weight of a person and then gives information about their health status based on the calculated BMI.

Further, it also gives information about what diet the person should take, according to the BMI.

While the Center for Nutrition Studies, Yenepoya University provided the content for the app, it was developed with technical support from **McGill International TB Centre, Montreal.**

The android based application has reportedly been endorsed by Revised National Tuberculosis Control Programme (RNTCP) and World Health Organisation (WHO).

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Home Cities Pune New app to assess nutrition, provide counselling for tuberculosis patients

# New app to assess nutrition, provide counselling for tuberculosis patients

The app was endorsed by the Revised National Tuberculosis Control Programme and WHO India, and was included in the new initiatives unveiled during the End TB Summit held recently

By: **Express News Service** | Pune | Updated: March 23, 2018 8:19 am

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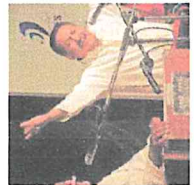


The app was endorsed by the Revised National Tuberculosis Control Programme and WHO India, and was included in the new initiatives unveiled during the End TB Summit held recently (Representational image)

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The Yenepoya (Deemed to be University) in Mangalore and McGill International TB Centre are set to release an android-based app for tuberculosis patients on World Tuberculosis Day on March 24. The app, called N-TB, will let the user calculate his or her body mass index (BMI). If the BMI is very low, the app will red-flag the fact and provide guidance on how to manage severe undernutrition. The app also provides a



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protein intake. It offers advice in getting a diet with an emphasis on the value of locally available foods in contrast to costly

nutritional supplements, activity and lifestyle. The app can be downloaded for free on Google Play.

This app, endorsed by the Revised National Tuberculosis Control Programme and

WHO India, was included in the new initiatives unveiled during the Delhi End TB Summit held recently.

Tuberculosis often results in significant weight loss, which can exacerbate underlying undernutrition. Studies in India have shown that 50 per cent of adult men and women with tuberculosis weigh below 42 kg and 38 kg respectively. Studies in rural India have also shown that tuberculosis (TB) patients have life-threatening levels of low BMI. Undernutrition in TB patients has been shown to be a consistent risk factor for death, and this is important in a country like India, where current levels of TB mortality are high with 423,000 deaths due to TB, said Dr Madhukar Pai, associate director, McGill International TB Centre.

The app was developed by Drs. Anurag Bhargava and Madhavi Bhargava. Dr Anurag said undernourished patients are at higher risk of serious side-effects from drugs, poor absorption of drugs, reduced ability to return to work and recurrence of disease after cure.



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**Health**

# N-TB app to help tuberculosis patients with diet launched

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The app was launched on March 24, World TB Day.

TNM Staff (<https://www.thenewsminute.com/author-articles/TNM-Staff>) |

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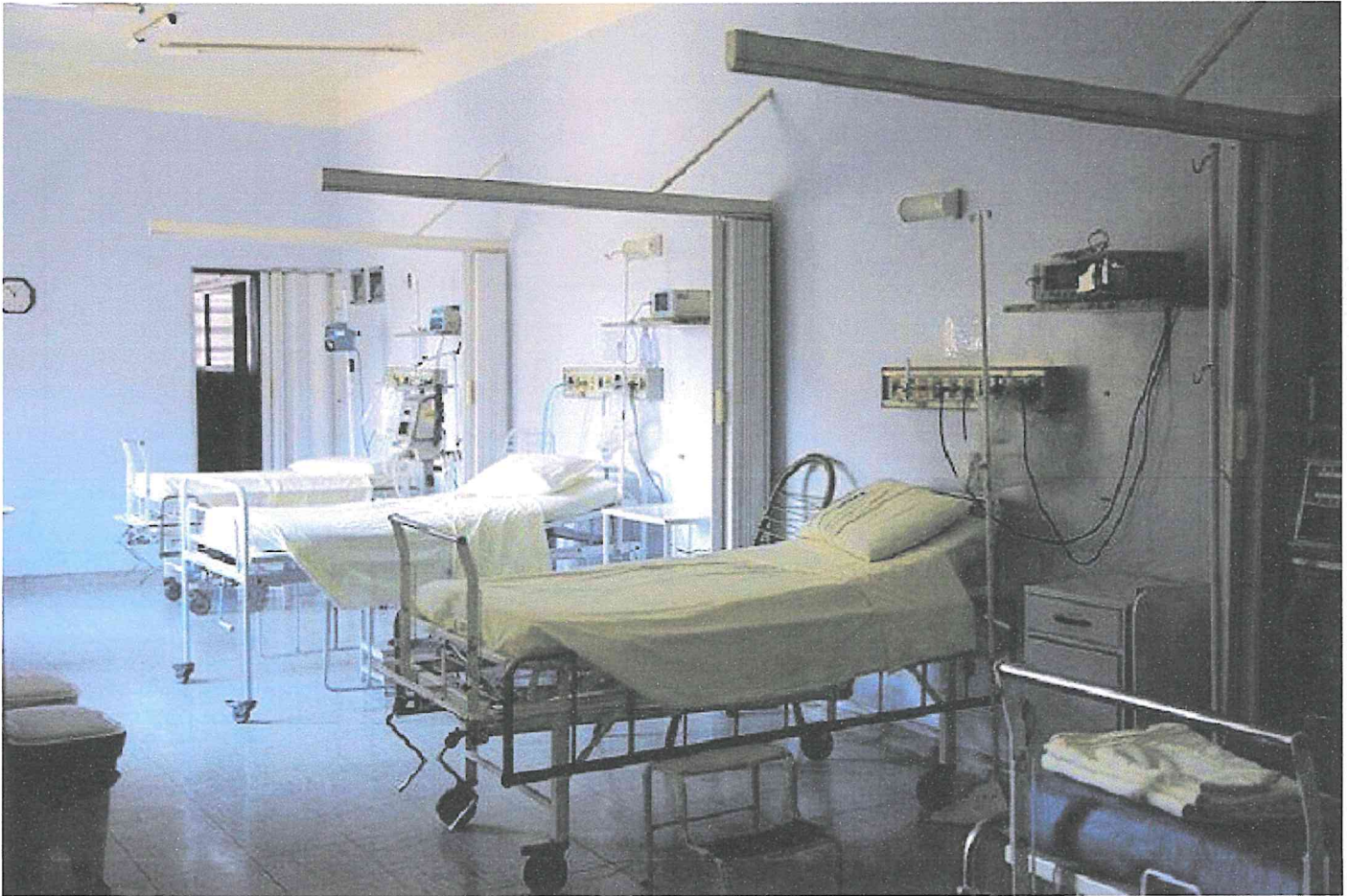
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N-TB, an app for TB patients, was launched on March 24, World Tuberculosis Day. The app was developed by Dr. Anurag Bhargava, a professor of Yenepoya University, Mangaluru.

The app is specially designed for TB patients to provide them nutritional information. N- TB asks for specific details such as the height and weight of a person and then gives information about their health status based on the calculated BMI.

Further, it gives information about what diet the person should take, according to their BMI.

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Speaking to the Deccan Herald (<http://m.deccanherald.com/?name=http://www.deccanherald.com/content/666217/mangaluru-professor-dr-anurag-bhargava.html>), Dr Bhargava said, "Certain aspects for the application such as analysing nutrition component, counselling are to be improvised."

The application has reportedly been endorsed by Revised National Tuberculosis Control Programme (RNTCP) and World Health Organisation (WHO). It was one of the new initiatives unveiled by the Prime Minister during the Delhi End TB Summit on March 13, 2018.

While the Center for Nutrition Studies, Yenepoya University provided the content for the app, it was developed with technical support from McGill International TB Centre, Montreal, reports The Hindu Business Line (<https://www.thehindubusinessline.com/news/n-tb-app-to-demystify-nutrition-for-tb-patients/article23336479.ece>).

Supposedly based on the Guidance Document on nutritional care and support for TB patients in India, Dr Bhargava says that he hopes medical professionals and nurses in private hospitals will use the app to treat their patients.

In India, over 1300 people die of TB every day. India bears the world's highest burden of TB, with approximately a quarter of all TB cases in the world. In 2015, close to five lakh people died of TB in India and every year, an estimated 1.3 lakh people are affected by drug-resistant TB (TB India Report 2017).

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# World TB Day: N-TB nutritional assessment app to be launched soon

By Team MMM on March 23, 2018

*The N-TB is the first of its kind app for healthcare providers. It enables the classification of the nutritional status of the patient by calculating the body mass index (BMI). If the BMI is very low, it red-flags it and provides an overview of management of severe under nutrition*



On World TB Day (24 March), the Center for Nutrition Studies, Yenepoya University, Mangalore in association with McGill International TB Centre, Montreal will release N-TB app, an android mobile based application for the nutritional assessment and counselling of adult patients with tuberculosis (TB).

This app, endorsed by the Revised National Tuberculosis Control Programme and WHO India, was included in the new initiatives unveiled by Prime Minister Narendra Modi during the Delhi End TB Summit on March 13.

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Dr. Gangadhara Somayaji K S  
(Faculty)

TB often results in significant weight loss, which can exacerbate underlying under nutrition. Studies in India have shown that 50% of adult men and women with TB weigh below 42 kg and 38 kg respectively. Studies in rural India have also shown life-threatening levels of low BMI.

Under nutrition in TB patients has been shown to be a consistent risk factor for death, and this is important in a country like India where current levels of TB mortality are high with 423,000 deaths due to TB.

The app provides information on the weight gain required during treatment to achieve a desirable weight, and the recommended daily caloric and protein intake. It has counselling tips on diet with an emphasis on the value of locally available foods in contrast to costly nutritional supplements, activity and lifestyle. The app is freely downloadable via Google Play.

Dr Anurag Bhargava, Professor of Medicine at Yenepoya University Mangalore and Adjunct Professor at Department of Medicine, McGill University, said, “ This app would help benefit any healthcare provider to assess the nutritional status of a TB patient. It can help doctors who do not have a BMI calculator at hand, if the BMI is severely low it would alert the healthcare provider. The app also provides counselling tips on diet and what can be eaten during therapy along with calorie and energy information from different food groups. Additional features are going to be made into this app it will be displayed on its updated version.”

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❖ BMI, body mass index, Delhi End TB Summit, diet and nutrition, health, healthcare, N-TB app, nutrition, nutritional assessment, TB deaths, TB patients, tuberculosis, World TB Day

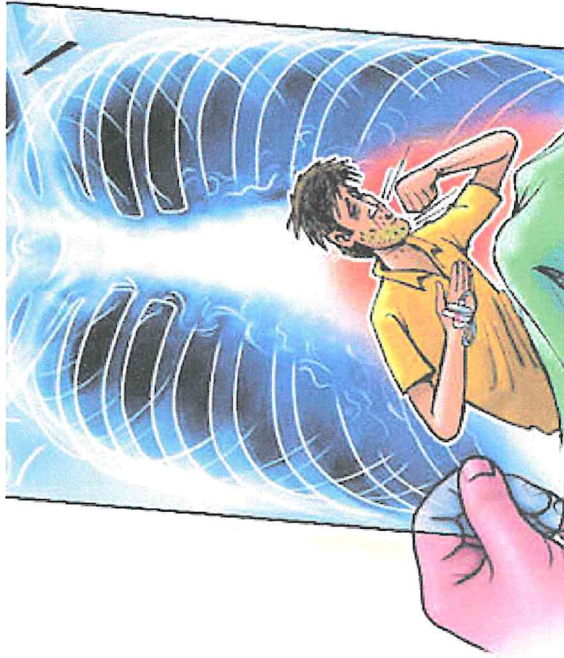
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**THE TIMES OF INDIA**

# World TB Day: 2.6% rise in TB cases from 2015-17

TNN | Mar 24, 2018, 09:54 AM IST



**CHANDIGARH:** Punjab witnessed 2.6% rise in tuberculosis (TB) cases between 2015 and 2017. Officials said more cases are coming out due to increased awareness and availability of advanced diagnostics. The health department has acquired 29 cartridgebased nucleic acid amplification test machines which can diagnose TB and rifampicin (one of the major TB drug combination drug) resistance within two hours.

“Recently the government issued a notification that doctors, druggists, chemists and hospital authorities could face a jail term of six months to two years under the provisions of Sections 269 (negligent act likely to spread infection of disease dangerous to life) and 270 (malignant act likely to spread infection of disease dangerous to life) of the Indian Penal Code.

With this, we will soon be able to detect missing cases,” said Dr Naresh Sharma, state TB officer.

Punjab shall also focus on under nutrition which is strongly connected to the disease.

“Poor hygiene and malnutrition are major risk factors for the latent TB bacteria to become active and spread. We will also use the application, N-TB, that has been recently endorsed by the WHO India to monitor the level of nutrition in these patients,” said Dr Naresh.

All health workers will be able to use this app which is developed in collaboration with McGill International TB Centre, Montreal, to assess and monitor the diet of the TB patients.

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“It enables the classification of the nutritional status of the patient by calculating the body mass index (BMI). The app also provides counselling tips on diet with an emphasis on the value of locally available foods in contrast to costly nutritional supplements, activity and lifestyle,” said Dr Anurag Bhargava, Center for Nutrition Studies, Yenepoya University, Mangalore.

  
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Raj Thackeray calls for 'Modi-mukt Bharat'



Raj Thackeray calls for 'Modi-mukt Bharat'

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# Mangaluru professor Dr Anurag Bhargava makes app for TB patients

DH News Service, Bengaluru/Mangaluru, Mar 24 2018, 9:18 IST



Dr Anurag Bhargava

A professor from Mangaluru has developed a first-of-its-kind mobile application for tuberculosis patients ahead of World Tuberculosis Day on Saturday (March 24).

An Android-based application 'N-TB' was developed by Dr Anurag Bhargava, professor of medicine, Yenepoya Deemed to be University, Mangaluru in collaboration with McGill International TB Centre, Canada, to calculate the body mass index (BMI) of patients with tuberculosis.

According to doctors, TB often results in significant weight loss, which can exacerbate under-nutrition. Under-nutrition in TB patients points toward a consistent risk factor. Such patients are also at a higher risk of side-effects of drugs, poor absorption of drugs, reduced ability to return to work, and recurrence of the disease.

The application will tell the users their BMI and will counsel them on an appropriate diet regime which includes daily caloric and protein intake based on their BMI.

"The application is currently intended to help healthcare providers to quickly assess the body mass index of patients with TB and how severely undernourished the patient is so that they can be guided

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accordingly," said Dr Bhargava.

He added that the TB cards currently record the weight alone and not the height to assess the nutritional status of the person, whereas the new application assesses the height and weight to calculate the BMI of the person.

He said the new N-TB mobile application specifies the weight and height and raises a red alert if it is below the desired weight.

The application was launched on Thursday (March 22) and is yet to be rolled out. It can currently be downloaded from Playstore free of cost.

"Certain aspects for the application such as analysing nutrition component, counselling are to be improvised," said Dr Bhargava.

The application, endorsed by Revised National Tuberculosis Control Programme (RNTCP) and World Health Organisation (WHO), was included in the new initiatives unveiled by Prime Minister Narendra Modi, during the Delhi End TB Summit on March 13, 2018.

"We are glad that such as application was developed, but we are yet to receive information on the use and implementation of the application," said Dr Ramachandra Bairy, Joint director, TB, Department of Health and Family Welfare, Karnataka.

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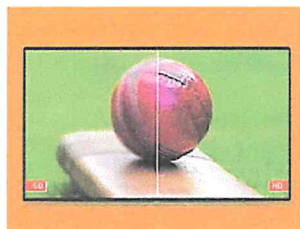
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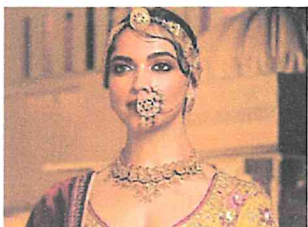
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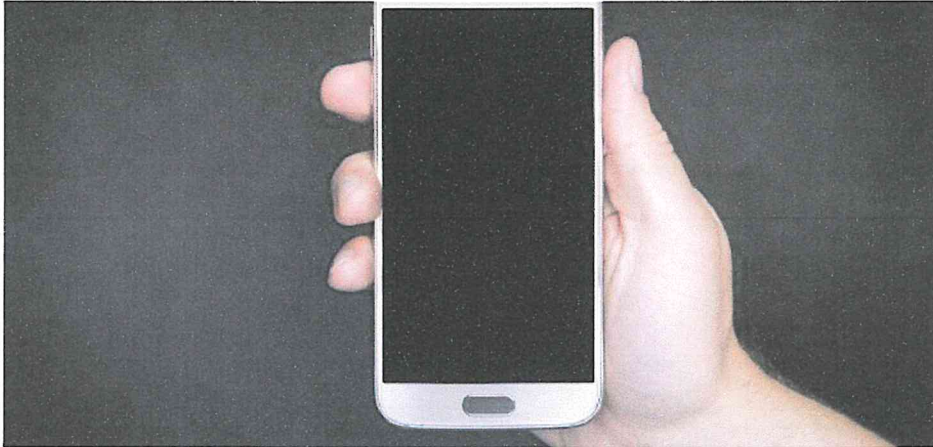
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## N-TB – first-of-kind app launched for nutritional assessment and counselling of tuberculosis patients

0 0

TUBERCULOSIS

CLINICAL DISEASES, OUTCOMES RESEARCH

Last updated: 23 March, 2018  
 AUTHORS: MARTHA POWELL, FUTURE SCIENCE GROUP

**On World TB Day (March 24th) the Center for Nutrition Studies at Yenepoya University (Mangalore, India), in association with the McGill International TB Center (Montreal, Canada), have announced the public release of N-TB – a mobile application for the nutritional assessment and counselling of adult tuberculosis patients.**

The N-TB app, which was included in new initiatives unveiled by the Prime Minister of India, Narendra Modi, during the Delhi End TB Summit on March 13th, has been endorsed by the Revised National Tuberculosis Control Program (RNTCP) and WHO India.

Tuberculosis often causes significant weight loss, which can exacerbate underlying undernutrition and can put patients at a higher risk of drug side-effects, poor drug absorption and recurrence of the disease, in addition to being a significant risk factor for death.

Dr Anurag Bhargava (Center for Nutrition Studies) explained: "Undernutrition is a highly prevalent co-morbidity in patients with TB in high-burden countries like India, which has potentially serious consequences like death, drug toxicity, malabsorption of drugs, poor nutritional recovery and relapse after cure."

WHO recommends that nutritional assessment, counselling and support should be considered an integral part of TB care, with 2017 seeing the RNTCP release a guidance document on nutritional care and support for tuberculosis patients in India – one of the first countries to do so.

The N-TB app is the first of its kind, enabling health care providers to classify the nutritional status of a patient by calculating their body mass index (BMI). If the BMI is low, the app will flag this and provides an overview of management for severe undernutrition, including counselling tips on diet with an emphasis on locally available foods, rather than nutritional supplements, activity and lifestyle.

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Remember to take a look at our latest [interview](#) with John Rex, on funding and finance in [antibiotic development](#): [bit.ly/2I5Ensu](http://bit.ly/2I5Ensu)

**Funding and finance in antibiotic development.**  
 We recently spoke about the funding and financing for antimicrobials with John Rex, who shares his

Bhargava commented: "Frontline care providers need help in nutritional assessment and counselling, as tools and training for these are not always available. This app aims to simplify that by making available calculations of body mass index BMI, desirable weight for the patient's height, recommended daily caloric and protein intakes, information on food groups and appropriate tips on diet."

"The app will enable appropriate nutritional care and support to the patients at highest risk of adverse outcomes (severely/extremely underweight). These categories are red-flagged and the app provides an overview of their management to front line care providers. This should hopefully translate into better outcomes."

The app can be downloaded on Google play.

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Source: N-TB press release

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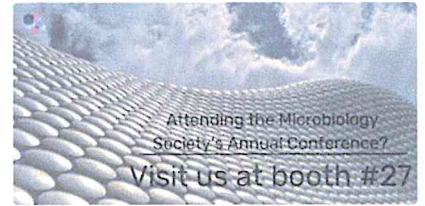
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In this interview, take a look behind the scenes of a recent @fsgfmb article investigating the collective #antibioticresistance of different bacterial #genotype populations, with author, Shilian Xu: [bit.ly/2ldrd1C](http://bit.ly/2ldrd1C)

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**A peek behind the paper – Shilian Xu on the d.**  
In this interview, at a recent Future Microbiology  
article investigating the collective resistance of  
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
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CONTRIBUTOR

IN THE NEWS

## A new app for nutritional assessment & counselling of patients with TB

On World TB Day, the Center for Nutrition Studies, Yenepoya University, India, in association with McGill International TB Centre, Canada, released N-TB, an android mobile based application for the nutritional assessment and counselling of adult

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Madhukar Pai Mar 23, 2018 0 0

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By Anurag Bhargava, Madhavi Bhargava, Tripti Pande & Madhukar Pai

TB often results in significant weight loss, which can exacerbate underlying undernutrition. Studies in India have shown that 50% of adult men and women with TB weigh below 42 kg and 38 kg respectively. Studies in rural India have also shown life-threatening levels of low BMI. Undernutrition in TB patients has been shown to be a consistent risk factor for death, and this is important in a country like India where current levels of TB mortality are high with 423,000 deaths due to TB.

Undernourished patients are also at higher risk of serious side-effects of drugs, poor

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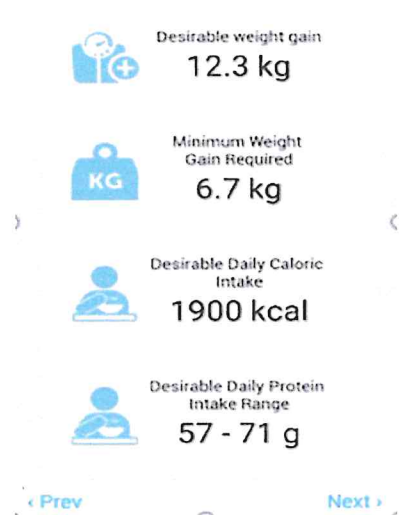
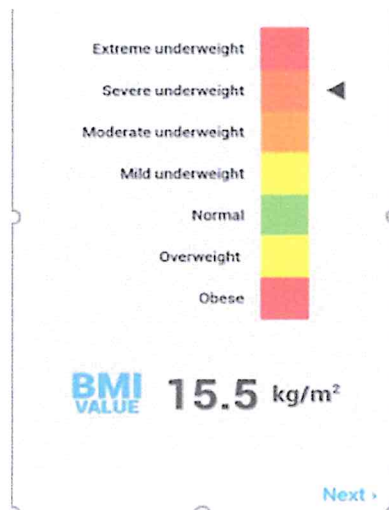
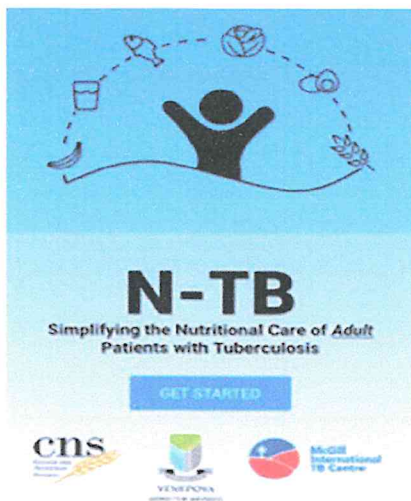


Undernutrition in TB patients is a medical condition like co-existing diabetes, or HIV infection. WHO recommends that nutritional assessment, counselling and support **should be considered an integral part of TB care**. The Indian National TB Program released a Guidance document on **Nutritional Care and Support for patients with tuberculosis in India in 2017**, one of the first countries to do so. This year has seen the launch of nutritional support initiatives in the form of food rations by many states. The Indian Government also announced a **direct benefit transfer of Rs. 500 per month, to enable nutritional support for TB patients**.

All these initiatives will require healthcare providers to be skilled in nutritional assessment and counselling. The N-TB is the first of its kind app for healthcare providers. It enables the classification of the nutritional status of the patient by calculating the body mass index (BMI). If the BMI is very low, it red-flags this and provides an overview of management of severe undernutrition. The app also provides the weight gain required during treatment to achieve a desirable weight, and the recommended daily caloric and protein intake (screen shots below). It has counselling tips on diet with an emphasis on the value of locally available foods in contrast to costly nutritional supplements, activity and lifestyle.

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The app, freely downloadable (at no cost) via [Google Play](#), is endorsed by the Revised National Tuberculosis Control Programme and WHO India, was included in the new initiatives unveiled by Prime Minister Narendra Modi during the Delhi End TB Summit on March 13<sup>th</sup> 2018.

As India gears up to implement [an ambitious TB Free India campaign](#), it's time to also focus on a measurable, preventable, and reversible coepidemic of undernutrition.

Madhavi & Anurag Bhargava are professors at Yenepoya Medical College, [Yenepoya University](#) in Mangalore, India. They also co-lead the newly created Centre for Nutritional Studies at Yenepoya Medical College.

Tripti Pande, currently a [Project Manager](#) at the McGill International TB Centre, obtained her BSc in Microbiology and Immunology at McGill University and completed her MScPH with a concentration in Global Health at Université Laval.

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# Science Speaks: Global ID News

A PROJECT OF IDSA GLOBAL HEALTH

## App addresses nutrition needs of TB patients

BY [ANTIGONE BARTON](#) ON [MARCH 23, 2018](#).

It's a measure of the time technology takes that now, finally, an app exists to address the wasting that gave tuberculosis its original name — consumption. Leading to malnutrition, serious side effects from drugs or failure to absorb medicines, the serious weight loss that can characterize the disease raises risks of death or recurrence of sickness after cure, and, diminishing patients' ability to work, adds to the catastrophic personal and financial fallout from illness.

In time for World TB Day researchers from McGill University's International TB Centre with researchers from the Center for Nutrition Studies at Yenepoya University of Mangalore are unveiling an app to help enable the nutritional assessment, counseling and support recommended by the World Health Organization as an integral part of TB care. The N-TB app, endorsed by India's National Tuberculosis Control Programme as well as by WHO India, calculates body mass index, red-flags those that are dangerously low, and sets out a response, providing weight gain and nutrition guidelines with recommended daily caloric and protein from locally available foods.

It is, of course, free, and is available [here](#).

THIS ENTRY WAS POSTED IN TB ON MARCH 23, 2018 [[HTTP://SCIENCESPEAKSBLOG.ORG/2018/03/23/APP-ADDRESSES-NUTRITION-NEEDS-OF-TB-PATIENTS/](http://sciencespeaksblog.org/2018/03/23/app-addresses-nutrition-needs-of-tb-patients/)].

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Thursday, April 15th 2021

HEALTH AND NUTRITION

# By grouping adolescents with adults, India's surveys are routinely misestimating their health

One major attempt to correct this has been a one-off.

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*W*

Sadhika Tiwari, [Indiaspend.com](https://Indiaspend.com)

Feb 15, 2021 · 07:30 pm

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Representational image. | Ahmad Masood/Reuters

India routinely misestimates thinness, overweight and stunting among adolescents because official data sources do not gather sufficient data specifically on adolescents, clubbing them instead with data on adults. This holds true across states, rural-urban residence and wealth groups, a June 2020 [study](#) says, showing up data gaps with wide-ranging implications for policy and programme design.

The key [National Family Health Survey](#) does not collect health and nutrition data for school-age children (6-year to 9-year-old) and [early adolescents](#) (10-year to 14-year-old), and does not separately categorise adolescents as 10-year to 19-year-olds, as [suggested by](#) the World Health Organization, the study says.

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adolescents (15-year to 19-year-old), and for adults.

Data on late adolescents, however, are clubbed with those of adults in the National Family Health Survey. Thus parameters used to assess adult nutritional status are used to assess undernutrition or overweight for adolescents aged 15-year to 19-year-old, leading to over-estimations of thinness, even as stunting remains undetected because no parameter examines adult stunting.

These data gaps were laid bare by another health ministry survey in 2019, which pointed out that tracking health and nutrition outcomes through [school-going age](#) (6-year to 9-year-old), and [early](#) and late adolescence is crucial to ensuring that nutritional deficiencies in childhood do not persist into adulthood.

Children [gain](#) up to 50% of their adult weight and skeletal mass and more than 20% of their adult height during adolescence, so they [must get](#) adequate nutrition and care. Adolescent underweight and overweight are also among the [indicators](#) used by the [Global Nutrition Report](#) to track countries' progress on malnutrition.

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Every second Indian teenage girl was [underweight](#) and 52% were anaemic, a [survey](#) conducted by the Naandi [foundation](#) among 74,000 girls aged 13-year to 19-year-old in 2018 found, as *IndiaSpend* [reported](#) in October 2018.

Besides its implications for individual health, adolescent wellbeing is also “key to achieving India’s demographic dividend”, [wrote](#) Manoj Jhalani, then the mission director for National Health Mission. India has 253 million adolescents, about a fifth of its [projected population of 1.34 billion for 2020](#). India’s working-age population at [688 million](#) still exceeds its dependent population—the so-called [demographic dividend](#).

Yet, few programmes target nutrition services towards adolescents in India, experts told us. The mid-day meal scheme is also only for school-going children aged between six-year and 13-year, excluding adolescents aged 14-year and older.

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The central government’s [Rashtriya Kishor Swasthya Karyakram](#) launched in 2014 has seen sporadic implementation six years on as *IndiaSpend* had [reported](#) earlier.

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said Anurag Bhargava, a co-author of the study, which suggests a continuing high burden of malnutrition in our young with low height-for-age (stunting) in 38% and low weight-for-age (underweight) in 35% of children under five. “Information on adolescent nutrition is however scant,” he added.

National Family Health Survey has health data on boys and girls only in the 15 years to 19 years age group, but clubs them with adults and has applied body-mass cutoffs inappropriate for this age group, he said. “While the brain attains 95% of its adult size by 6 years of age, memory, emotional processing, decision-making, and higher executive functions develop during mid-childhood and adolescence,” the study said, citing a February 2018 [study](#) published in *The Lancet* medical journal.

## National Family Health Survey

[National Family Health Survey](#) is a periodic, large-scale health and demographic household-level survey that provides key data on which the health ministry and other agencies base their policies and programmes.

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Indicators such as body mass index, blood sugar levels and hypertension are available for adults. Crucial indicators such as body mass index are not separately assessed for children aged six to nine and adolescents aged 10 years to 19 years. In the recently released [National Family Health Survey-5 \(2019-2020\)](#) reports, anaemia prevalence for 15-year to 19 year-olds has been listed separately, though the data for 6-year to 14-year-olds are still missing.

# Health Indicator Data In National Family Health Survey, By Age Group

Available Not Available Clubbed with adults Not Relevant

Indicator	Pre-school (0-5 yrs)	School age children (6-9 yrs)	Early adolescents (10-14 yrs)	Late adolescents (15-19 yrs)	Adults (20+ yrs)
Stunting	Available	Not Available	Not Available	Not Available	Not Available
Wasting	Available	Not Available	Not Available	Not Available	Not Available
Underweight	Available	Not Available	Not Available	Clubbed with adults	Available
Overweight or obese	Available	Not Available	Not Available	Clubbed with adults	Available
Body Mass Index (BMI)	Not Available	Not Available	Not Available	Clubbed with adults	Available
Anaemia	Available	Not Available	Not Available	Clubbed with adults	Available
Blood sugar level	Not Available	Not Available	Not Available	Clubbed with adults	Available
Hypertension	Not Available	Not Available	Not Available	Clubbed with adults	Available
Substance use	Not Relevant	Not Available	Not Available	Clubbed with adults	Available

Source: [National Family Health Survey](#) - Data visual: Gulal Salil



“Children and adolescents of these ages are increasingly experiencing anaemia, micronutrient deficiencies, diabetes, chronic kidney diseases, cardiovascular diseases like hypertension and cancer,” **Madhavi Bhargava, the lead author** of the

The National Family Health Survey does not use [age and sex-specific reference](#) for adolescents, as recommended by the WHO, to estimate their nutritional status, leading to an overestimation of thinness while stunting has remained undetected despite being prevalent across states, the [study](#), which was led by a team of researchers at the [Yenepoya Medical College and Research Centre in Mangalore](#), found in March 2020.

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The prevalence of thinness in boys and girls thus estimated is 58.1% and 46.8% in National Family Health Survey-3, and 45% and 42% in National Family Health Survey-4, respectively. The [study](#) used WHO-recommended age- and sex-specific references to find that 22.3% of boys and 9.9% of girls were too thin in 2005-2006 and 16.5% and 9% in 2015-2016 – lower than National Family Health Survey estimates.

This means that 15-year to 19-year-olds are not as thin as the average for the 15-year to 49-year-old category suggests, said Madhavi. “The problem lies within our definition of adolescents while collecting this data; 15-year to 19-year-olds are considered adults and 5-year to 14-year-olds have no mention.” Though Indians are

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On the other hand, stunting, another important metric for malnutrition in 15-year to 19-year-olds, has remained hidden in the data of National Family Health Survey-3 and -4. “Stunting was found in more than 30% in boys and girls in National Family Health Survey-4, with a disturbing increase in National Family Health Survey-4 compared to National Family Health Survey-3,” said Anurag Bhargava. Stunting can also complicate estimates of both thinness and overweight in children and adolescents.

Around two-thirds of the working population in India are earning 13% less because of stunting in childhood – being excessively short for their age – one of the world’s highest such reductions in per capita income, *IndiaSpend* [reported](#) in 2018.

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## Other surveys

The [Comprehensive National Nutrition Survey](#) conducted between 2016-2018 by the Ministry of Health and Family Welfare along with the [United Nations Children’s Fund](#) and international health and development research group [Population Council](#), collected nutrition data for 6- to 14-year-olds for the first time. The Comprehensive National Nutrition Survey estimated the prevalence of

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“Previous national surveys had not collected nationally representative data on children between the age of 5 years and 14 years,” Comprehensive National Nutrition Survey [noted](#) in the 2016-2018 report while explaining its purpose.

Comprehensive National Nutrition Survey was the largest micronutrient survey ever conducted – it interviewed 1,12,316 children and adolescents and collected their anthropometric measures. It collected blood, urine and stool samples from 51,029 children and adolescents, across 30 states (including the National Capital Territory of Delhi) covering rural and urban households.

The data were analysed at the state and national level across the urban/rural, male/female and slum/non-slum (only for Delhi, Mumbai, Chennai, Kolkata) domain. Data were collected from three target population groups – pre-schoolers (0 to 4-year-olds), school-age children (5-year to 9-year-olds) and adolescents (10-year to 19-year-olds). A minimum sample size of 1,000 for anthropometric and 500 for biochemical indicators was fixed for each age group in each state.

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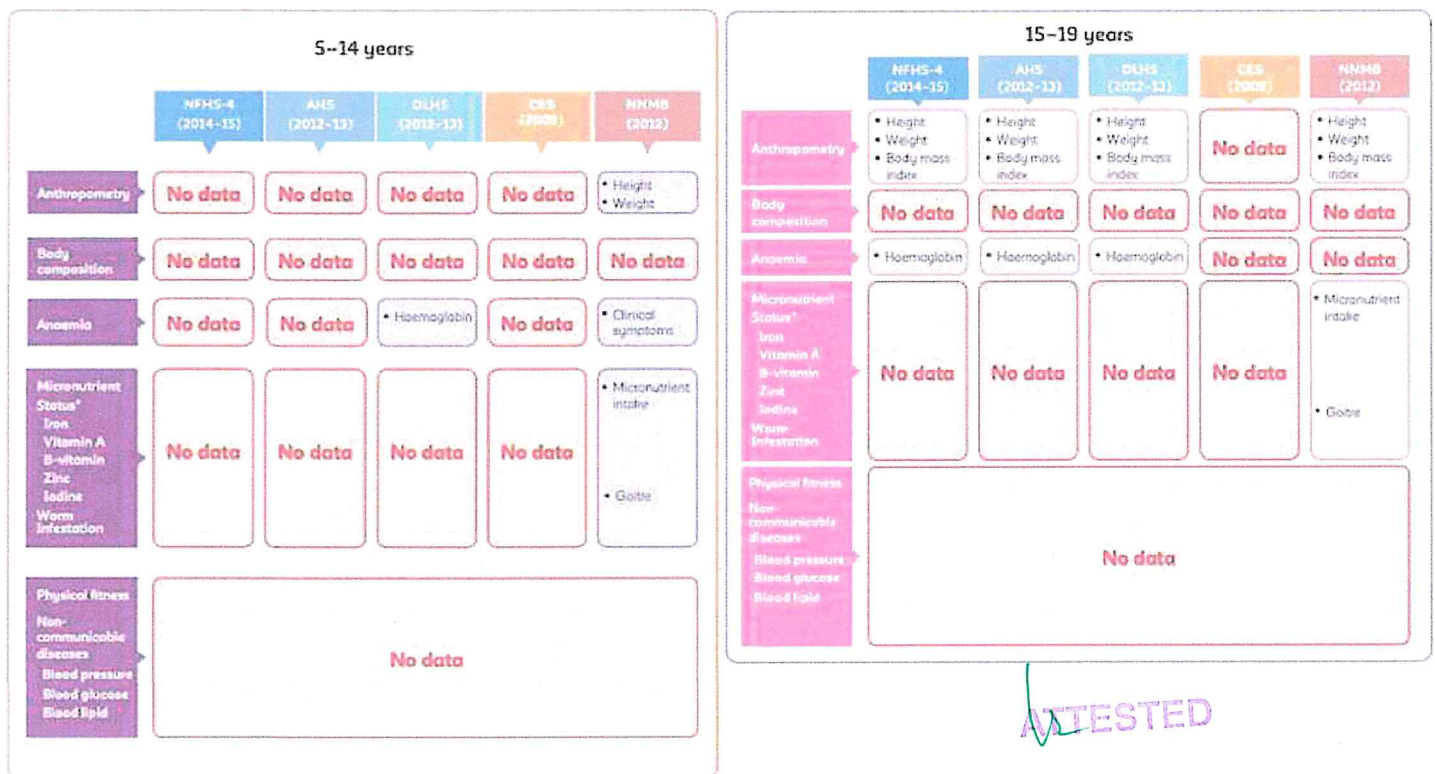
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The National Family Health Survey covers a wide range of data, as explained earlier, across each Indian state and Union Territory, and produces indicators at the district, state/Union Territory, and national levels, as well as separate estimates for urban and rural areas in 157 districts, and separate estimates for slum and non-slum areas in eight cities.

Other national surveys, such as the Annual Health Survey 2012-2013, District Level Household Survey 2012-2012, Coverage Evaluation Survey 2009 and data collected by the National Nutrition Monitoring Bureau in 2012 – have also not collected data for the 5-year to 19-year-old age group, separately, for several important health indicators.

### Nutrition data availability and gaps



Source: Comprehensive National Nutrition Survey (2016-2018)

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But it also has no data on adolescent sexual behaviour, sexual health, maternal health, teenage pregnancies, early child-bearing and diseases such as HIV, which are important indicators of adolescent health and wellbeing, United Nations International Children's Emergency Fund said in [A report on adolescents](#) published in April 2012. It also does not have data on substance use and abuse and its impact on adolescent health.

“Indicators like teenage pregnancies and substance abuse are important for adolescents,” said Madhavi Bhargava. “So is mental health but Comprehensive National Nutrition Survey is not a comprehensive health survey, it is a national nutrition survey. We do not have data-based information on these issues even though we have programs like Rashtriya Kishor Swasthya Karyakram working for adolescents on these very issues.”

## Policy neglect

As a result, adolescent nutrition has witnessed severe policy neglect, as a majority of nutrition funds and programmes have been focused on children between 0 to 5 years or pregnant women.

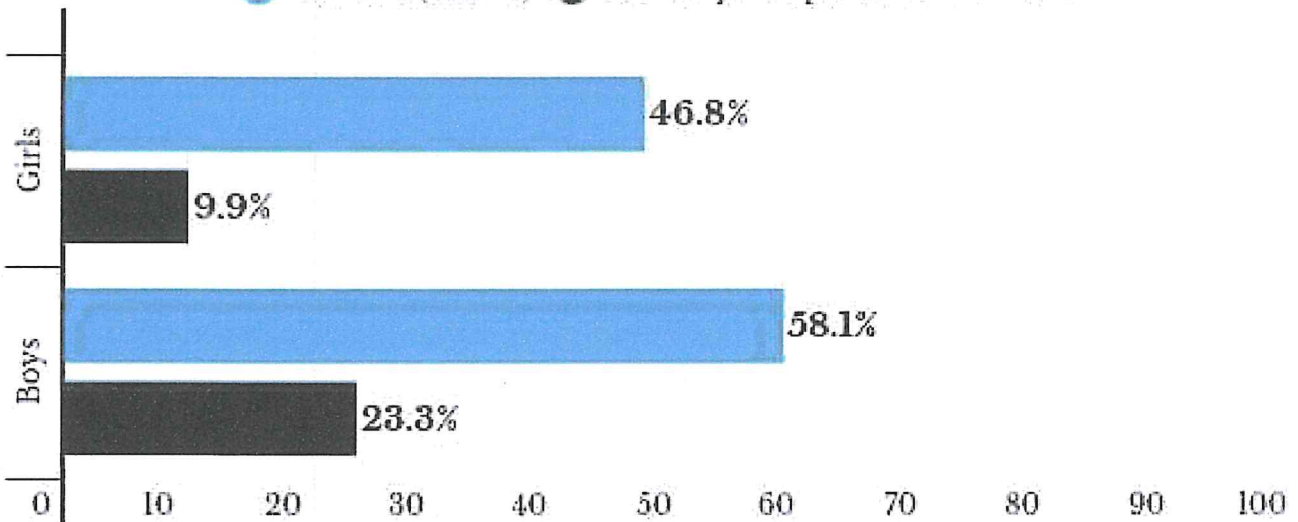
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# Thinness In Adolescents (15-19 years)

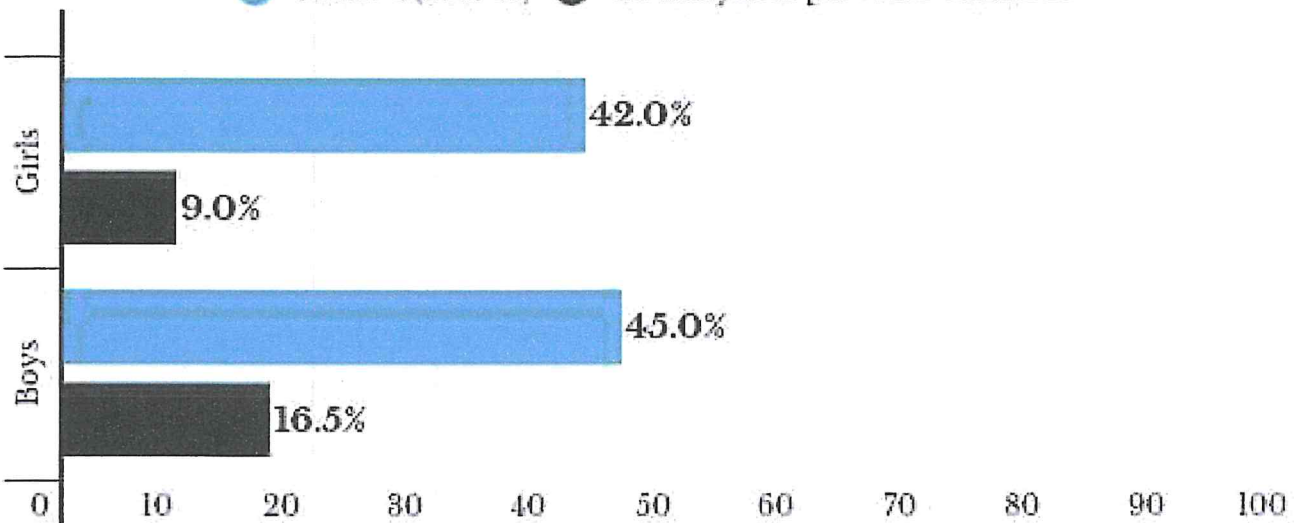
## NFHS-3

NFHS-3 (2005-6) Re-analysis as per WHO standards



## NFHS-4

NFHS-4 (2015-16) Re-analysis as per WHO standards



Source: Nutritional status of Indian adolescents (15-19 years) from National Family Health Surveys 3 and 4: Revised estimates using WHO 2007 Growth reference

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“Stunting is a major indicator of malnutrition, despite which stunting in adolescents has received less attention as a public health problem,” Anurag Bhargava said. “The lack of nutritional support for adolescents, especially adolescent girls, leads to intergenerational malnutrition when a stunted and malnourished mother gives birth to a malnourished low-birth-weight child.”

## Inadequate programmes

The result of insufficient information on early adolescents has been inadequate programmes to target them, experts told us.

“Not enough programmes are functioning in India to look after adolescent nutrition,” said Yogendra Ghorpade, field coordinator of [TANDA](#), a field action project at the [Tata Institute of Social Sciences](#). “Mid-day meals are not provided to children after class 8 [age 13 years onwards], a few states distribute iron-folic acid tablets to adolescent girls through the Integrated Child Development Services or Anganwadis, but this is neither available everywhere, nor does it include

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[Swasthya Karyakram](#), or National Adolescent Health Programme, in 2014 to address nutrition, reproductive health, substance abuse, mental health and other issues concerning adolescents. [Adolescent friendly health clinics](#) were set up in every state and Union territory except Lakshadweep, to provide clinical and counselling services on diverse adolescent health issues through trained service providers at Adolescent friendly health clinics, located in community health centres, district hospitals and medical colleges.

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But this programme has not been functioning well. “Even when specifically targeted programmes are designed for adolescents and their needs, their beneficiaries remain few because we know so little about this age group,” said Ghorpade, “For instance, if we can’t map the trends of teenage sex, pregnancy and uptake of family planning services in the age group, how can we even begin to design programmes to address these needs?”

“Programmes like Rashtriya Kishor Swasthya Karyakram are just skimming the surface because we do not know the extent of the problems we are trying to tackle,” said Anjani Kumar Singh, programme manager, Vatsalya, an NGO working

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Gangadhara Somayaji KS  
Yogendra Kumar Singh



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# How Incomplete Health Data On Adolescents Hamper Policy Design

By grouping adolescents with adults, India's health surveys routinely misestimate adolescents' health--across states, wealth groups and rural-urban residence. One major attempt to correct this has been a one-off.

By Sadhika Tiwari | 12 Feb, 2021



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**New Delhi:** India routinely misestimates thinness, overweight and stunting among adolescents because official data sources do not gather sufficient data specifically on adolescents, clubbing them instead with data on adults. This holds true across states, rural-urban residence and wealth groups, a June 2020 study says, showing up data gaps with wide-ranging implications for policy and programme design.

The key [National Family Health Survey](#) (NFHS) does not collect health and nutrition data for school-age children (6-9 years) and [early adolescents](#) (10-14 years), and does not separately categorise adolescents as 10-19-year-olds, as [suggested by](#) the World Health Organization (WHO), the study says.

Other large-scale household health surveys conducted for the Ministry of Health and Family Welfare (MoHFW) health ministry also have few or no data on these age groups, our analysis has found. These surveys collect data on a broad range of health and related indicators for infants and pre-school children (0 to 5 years), for late adolescents (15 to 19 years), and for adults. Data on late adolescents, however, are clubbed with those of adults in the NFHS. Thus parameters used to assess adult nutritional status are used to assess undernutrition or overweight for adolescents aged 15-19, leading to over-estimations of thinness, even as stunting remains undetected because no parameter examines adult stunting.

These data gaps were laid bare by another health ministry survey in 2019, which pointed out that tracking health and nutrition outcomes through [school-going age](#) (6-9), and [early](#) and late adolescence is crucial to ensuring that nutritional deficiencies in childhood do not persist into adulthood. Children [gain](#) up to 50% of their adult weight and skeletal mass and more than 20% of their adult height during adolescence, so they [must get](#) adequate nutrition and care. Adolescent underweight and overweight are also among the [indicators](#) used by the [Global Nutrition Report](#) to track countries' progress on

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Besides, nutrition tracking must also be sex-specific, as girls are more likely to be under-nourished, according to [a report](#) by the Food and Agriculture Organization. This is particularly important in [cases](#) of child marriage and under-age pregnancy, as malnourished mothers give birth to under-nourished children. Every second Indian teenage girl was [underweight](#) and 52% were anaemic, a [survey](#) conducted by the Naandi [foundation](#) among 74,000 girls aged 13-19 years in 2018 found, as **IndiaSpend** [reported](#) in October 2018.

Besides its implications for individual health, adolescent wellbeing is also "key to achieving India's demographic dividend", [wrote](#) Manoj Jhalani, then the mission director for National Health Mission. India has 253 million adolescents, about a fifth of its [projected population of 1.34 billion for 2020](#). India's working-age population at [688 million](#) still exceeds its dependent population--the so-called [demographic dividend](#).

Yet, few programmes target nutrition services towards adolescents in India, experts told us. The mid-day meal scheme is also only for school-going children aged between six and 13, excluding adolescents aged 14 and older.

The central government's [Rashtriya Kishor Swasthya Karyakram \(RKSK\)](#) launched in 2014 has seen sporadic implementation six years on as **IndiaSpend** had [reported](#) earlier. Iron-folic acid tablets are distributed only to adolescent girls, and not boys, who are also malnourished, other [surveys](#) have found.

"We have a lot of information on nutritional status of children under-five in India," said Anurag Bhargava, a co-author of the study, which suggests a continuing high burden of malnutrition in our young with low height-for-age (stunting) in 38% and low weight-for-age (underweight) in 35% of children under five. "Information on adolescent nutrition is however scant," he added.

NFHS has health data on boys and girls only in the 15-19 age group, but clubs

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group, he said. "While the brain attains 95% of its adult size by 6 years of age, memory, emotional processing, decision-making, and higher executive functions develop during mid-childhood and adolescence," the study said, citing a February 2018 [study](#) published in *The Lancet* medical journal.

## National Family Health Survey

[NFHS](#) is a periodic, large-scale health and demographic household-level survey that provides key data on which the health ministry and other agencies base their policies and programmes.

It collects health and nutrition indicators such as mortality rates, childhood diseases such as diarrhoea and access to immunisation, and malnutrition indicators such as stunting (height for age), wasting (weight for height) and underweight (weight for age) for children till age five.

Indicators such as body mass index (BMI), blood sugar levels and hypertension are available for adults. Crucial indicators such as BMI are not separately assessed for children aged six to nine and adolescents aged 10 to 19. In the recently released [NFHS-5 \(2019-20\)](#) reports, anaemia prevalence for 15-19 year-olds has been listed separately, though the data for 6-14 year-olds are still missing.

"Children and adolescents of these ages are increasingly experiencing anaemia, micronutrient deficiencies, diabetes, chronic kidney diseases, cardiovascular diseases like hypertension and cancer," Madhavi Bhargava, the lead author of the study, told **IndiaSpend**. "If undetected at adolescence, these will impact the health and well-being of the adult."

## Incorrect estimates of thinness, stunting

The NFHS does not use [age and sex-specific reference](#) for adolescents, as recommended by the WHO, to estimate their nutritional status, leading to an

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being prevalent across states, the [study](#), which was led by a team of researchers at the [Yenepoya Medical College](#) and Research Centre in Mangalore, found in March 2020.

The prevalence of thinness in boys and girls thus estimated is 58.1% and 46.8% in NFHS-3, and 45% and 42% in NFHS-4, respectively. The [study](#) used WHO-recommended age- and sex-specific references to find that 22.3% of boys and 9.9% of girls were too thin in 2005-06 and 16.5% and 9% in 2015-16--lower than NFHS estimates.

This means that 15- to 19-year-olds are not as thin as the average for the 15- to 49-year-old category suggests, said [Madhavi](#). "The problem lies within our definition of adolescents while collecting this data; 15- to 19-year-olds are considered adults and 5-14-year-olds have no mention." Though Indians are legally considered adults at age 18 for purposes such as [voting](#), this is not the same as adulthood according to the life cycle, which is the basis of health policies and begins at [20 years](#).

On the other hand, stunting, another important metric for malnutrition in 15- to 19-year-olds, has remained hidden in the data of NFHS 3 and 4. "Stunting was found in more than 30% in boys and girls in NFHS-4, with a disturbing increase in NFHS-4 compared to NFHS-3," said [Anurag Bhargava](#). Stunting can also complicate estimates of both thinness and overweight in children and adolescents.

Around two-thirds of the working population in India are earning 13% less because of stunting in childhood--being excessively short for their age--one of the world's highest such reductions in per capita income, [IndiaSpend](#) [reported](#) in 2018.

## CNNS and other surveys

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The [Comprehensive National Nutrition Survey](#) (CNNS) conducted between 2016-18 by the MoHFW along with the [United Nations Children's Fund](#) and international health and development research group [Population Council](#), collected nutrition data for 6- to 14-year-olds for the first time. The CNNS estimated the prevalence of malnutrition, anaemia, micronutrient deficiencies and biomarkers of non-communicable diseases in preschoolers (0-4 years), school-age children (5-9 years) and adolescents (10-19 years).

"Previous national surveys had not collected nationally representative data on children between the age of 5 and 14 years," CNNS [noted](#) in the 2016-18 report while explaining its purpose.

CNNS was the largest micronutrient survey ever conducted--it interviewed 112,316 children and adolescents and collected their anthropometric measures; it collected blood, urine and stool samples from 51,029 children and adolescents, across 30 states (including the National Capital Territory of Delhi) covering rural and urban households. The data were analysed at the state and national level across the urban/rural, male/female and slum/non-slum (only for Delhi, Mumbai, Chennai, Kolkata) domain. Data were collected from three target population groups--pre-schoolers (0-4 years), school-age children (5-9 years) and adolescents (10-19 years). A minimum sample size of 1,000 for anthropometric and 500 for biochemical indicators was fixed for each age group in each state.

But the CNNS survey was a one-off, said Madhavi Bhargava, "The document does not say if it will happen again. We need regular and periodic estimates for adolescents like we get for children and adults from the NFHS."

The NFHS covers a wide range of data, as explained earlier, across each Indian state and union territory, and produces indicators at the district, state/union territory (UT), and national levels, as well as separate estimates for urban and

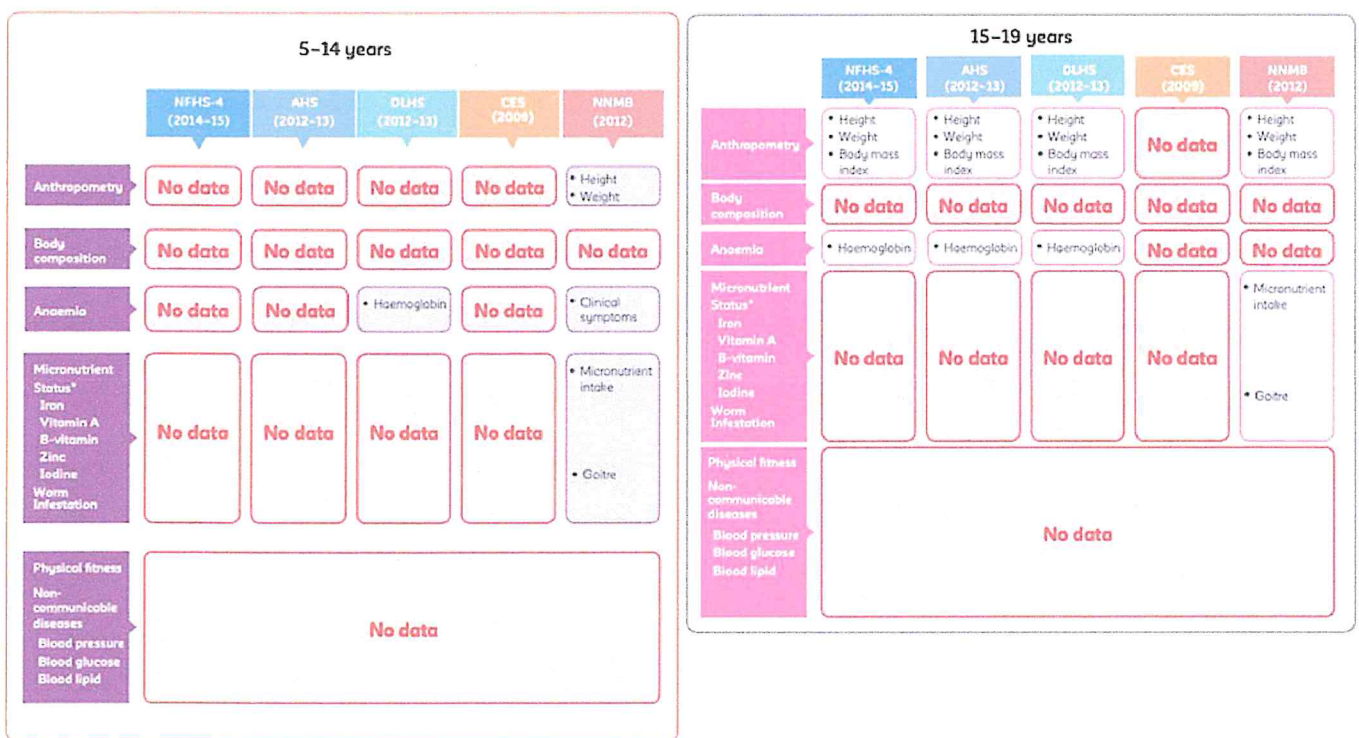
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rural areas in 157 districts, and separate estimates for slum and non-slum areas in eight cities.

Other national surveys, such as the Annual Health Survey 2012-13 (AHS), District Level Household Survey 2012-12 (DLHS), Coverage Evaluation Survey 2009 (CES), and data collected by the National Nutrition Monitoring Bureau in 2012 (NNMB)--have also not collected data for the 5-19 age group, separately, for several important health indicators.

### Nutrition Data Availability & Gaps In Children, Early Adolescents



Source: [Comprehensive National Nutrition Survey \(2016-18\)](#)

The CNNS survey has data on several indicators including stunting, wasting, underweight, overweight or obesity, BMI, anaemia, blood sugar levels and hypertension, among others, for adolescents.

But it also has no data on adolescent sexual behaviour, sexual health, maternal health, teenage pregnancies, early child-bearing and diseases such as HIV, which are important indicators of adolescent health and wellbeing, UNICEF



said in '[A report on adolescents](#)' published in April, 2012. It also does not have data on substance use and abuse and its impact on adolescent health.

"Indicators like teenage pregnancies and substance abuse are important for adolescents. So is mental health but CNNS is not a comprehensive health survey, it is a national nutrition survey," said Madhavi Bhargava. "We don't have data-based information on these issues even though we have programs like RKSK working for adolescents on these very issues."

## Policy neglect

As a result, adolescent nutrition has witnessed severe policy neglect, as a majority of nutrition funds and programmes have been focused on children between 0-5 years or pregnant women.

Although the [first 1,000 days](#) (roughly two years of age) get much attention, the next 7,000 days (up to 19 years) offer opportunities to catch up, and adolescence is the last window of opportunity, said Anurag Bhargava, adding, "Our data suggests that we are losing that opportunity."

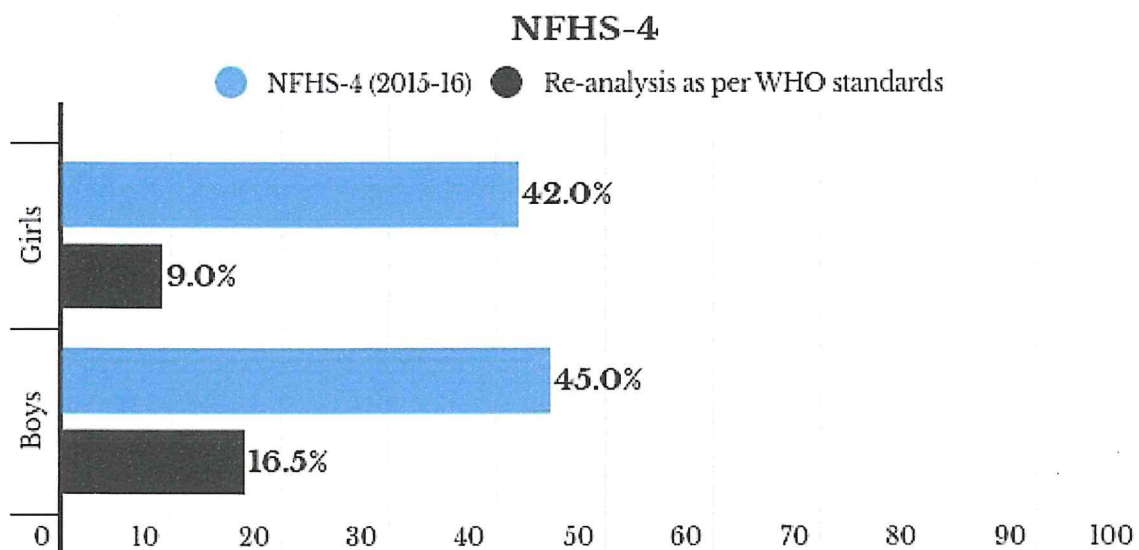
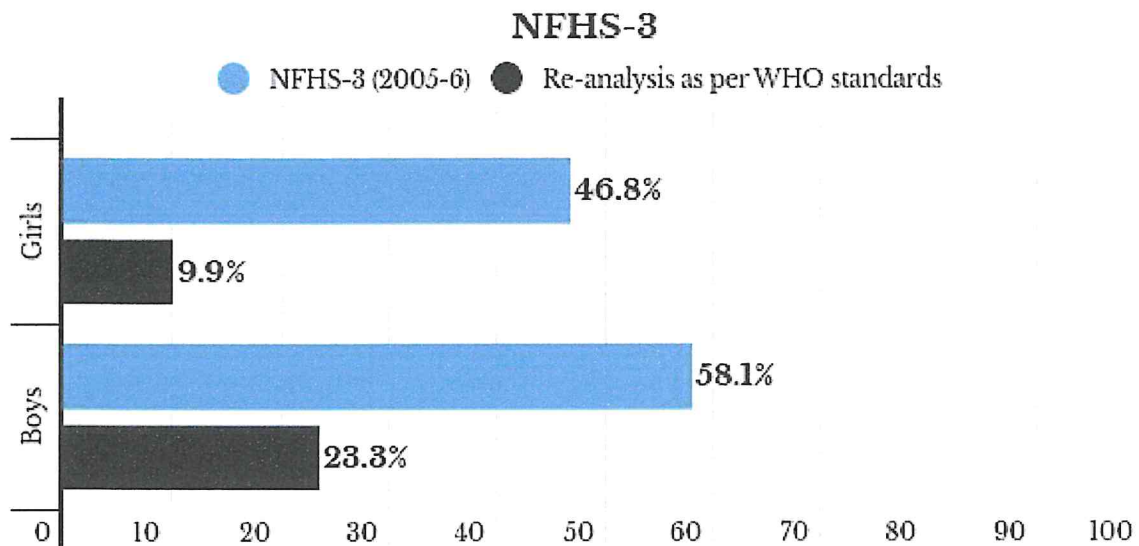
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## Thinness In Adolescents (15-19 years)



**Source:** Nutritional status of Indian adolescents (15-19 years) from National Family Health Surveys 3 and 4: Revised estimates using WHO 2007 Growth reference



More than 33% of the disease burden and almost 60% of premature deaths among adults can be associated with behaviours or conditions that begin or occur during adolescence, according to a 2014 [report](#) by the WHO.

"Stunting is a major indicator of malnutrition, despite <sup>ATTESTED</sup> which stunting in

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Bhargava said. "The lack of nutritional support for adolescents, especially adolescent girls, leads to intergenerational malnutrition when a stunted and malnourished mother gives birth to a malnourished low-birth-weight child."

## Inadequate programmes

The result of insufficient information on early adolescents has been inadequate programmes to target them, experts told us. "Not enough programmes are functioning in India to look after adolescent nutrition," said Yogendra Ghorpade, field coordinator of [TANDA](#), a field action project at the [Tata Institute of Social Sciences](#). "Mid-day meals are not provided to children after class 8 [age 13 onwards], a few states distribute iron-folic acid tablets to adolescent girls through the ICDS or *anganwadis*, but this is neither available everywhere, nor does it include adolescent boys who are also malnourished. The few places where these services were available, have also been very inconsistent ever since the lockdown started."

The MoHFW launched the [Rashtriya Kishor Swasthya Karyakram \(RKSK\)](#), or National Adolescent Health Programme, in 2014 to address nutrition, reproductive health, substance abuse, mental health and other issues concerning adolescents. [Adolescent friendly health clinics \(AFHCs\)](#) were set up in every state and Union territory except Lakshadweep, to provide clinical and counselling services on diverse adolescent health issues through trained service providers at AFHCs, located in community health centres, district hospitals and medical colleges.

But this programme has not been functioning well. "Even when specifically targeted programmes are designed for adolescents and their needs, their beneficiaries remain few because we know so little about this age group," said Ghorpade, "For instance, if we can't map the trends of teenage sex, pregnancy and uptake of family planning services in the age group, how can we even begin

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"Programmes like RKSK are just skimming the surface because we don't know the extent of the problems we are trying to tackle," said Anjani Kumar Singh, programme manager, Vatsalya, an NGO working on child-rights, nutrition and health in Uttar Pradesh. "The uptake of services is scanty when the design of programmes is poor."

*We welcome feedback. Please write to [respond@indiaspend.org](mailto:respond@indiaspend.org). We reserve the right to edit responses for language and grammar.*

Health data Policy

Sadhika  
Tiwari

Sadhika is a development journalist based in New Delhi. She has covered public health, gender issues and environment during her journalism career, which started with her internships during her undergraduate studies with organisations like NDTV 24x7, Asian Age, Gaon Connection and Economic Times. She has previously worked with GoNews, India's first app-based news channel as an anchor and senior correspondent where she also covered the 2019 general elections from the hinterlands of India. She holds an honours degree in Journalism Bachelors from Delhi University.

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APPEARED IN "VIJAYA KARNATAKA" DATED ON 21.05.18

## ಡಾ. ಶ್ಯಾಮ್ ಎಸ್. ಭಟ್ ತಂಡಕ್ಕೆ ಅಂತಾರಾಷ್ಟ್ರೀಯ ಸಮ್ಮಾನ

ಕೊಣಾಡಿ: ದೇಶಭಕ್ತಿಯ ಯಶಸ್ವೀಯ ದಂತೆ ಮಹಾ ವಿದ್ಯಾಲಯದ ಶೈಕ್ಷಣಿಕ ಪ್ರವೃತ್ತಿಗಳ ಹಾಗೂ ಮಕ್ಕಳ ದಂತ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಡಾ. ಶ್ಯಾಮ್ ಎಸ್ ಭಟ್ ಮತ್ತು ಅವರ ತಂಡ 'ಆಟಗಂ ಮಕ್ಕಳಲ್ಲಿ ಏಜಿ ಫೋರ್ ಜಿ ಪ್ರಮಾಣ' ಎಂಬ ಸಂಶೋಧನೆಗೆ ಹೊಸದೊಂದು ದಾರಿಯನ್ನು ಸೌಧ್ಯ ಆಫ್ ಮೆಡಿಕಲ್ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಆನುವಾಸಿ ದೊಡ್ಡದ್ದು. ಈಗಾಗಲೇ ಅಂತಾರಾಷ್ಟ್ರೀಯ ಸಮ್ಮಾನ ವಿವರಣೆ.



ನೆರವಿ ಶ್ಯಾಂಡೆನ ರಾಟರಾಡಮಾನಲ್ಲಿ ನಡೆದ ಅಂತಾರಾಷ್ಟ್ರೀಯ ಆಟಗಂ ಸಂಶೋಧನೆಯ ವಾರ್ಷಿಕ ಸಭೆಯಲ್ಲಿ ಈ ಸಂಶೋಧನೆಗೆ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಮತ್ತು ಐಸಿಎಂಆರ್‌ನಿಂದ ಆನುವಾಸಿ ದೊಡ್ಡದ್ದು.

ಡಾ. ಶ್ಯಾಮ್ ಎಸ್ ಭಟ್ ಮತ್ತು ಸಂಶೋಧನಾ ವಿದ್ಯಾರ್ಥಿ ಭುವನೇಶ್ ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಸಭೆಯಲ್ಲಿ ಭಾಗವಹಿಸಿ ಸಂಶೋಧನೆ ಪ್ರಸ್ತುತವಿಡಿದರು.

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## ಸಂಶೋಧನೆಗೆ ಅನುದಾನ



ವಾರ್ಷಿಕ ಸಭೆಯಲ್ಲಿ ಪಾಲ್ಗೊಂಡ ಡಾ.ಎಸ್.ಶ್ಯಾಮ್ ಭಟ್, ಭವನೇಶ್.

■ ವಿಜಯವಾಣಿ ಸುದ್ದಿಜಾಲ ಉಳ್ಳಾಲ  
ಅಂತಾರಾಷ್ಟ್ರೀಯ ಸಮ್ಮೇಳನದಲ್ಲಿ ಯುನೆಸ್ಕೋಯ ದಂತ ಕಾಲೇಜಿನ ಉಪಪ್ರಾಂಶುಪಾಲ ಡಾ.ಶ್ಯಾಮ್ ಎಸ್.ಭಟ್ ಮತ್ತು ನೇತೃತ್ವದ ತಂಡ 'ಮಕ್ಕಳಲ್ಲಿ ಅಟಿಸಂ ಪ್ರಮಾಣ' ಸಂಶೋಧನೆಗೆ ದೆಹಲಿಯ ಇಂಡಿಯನ್ ಕೌನ್ಸಿಲ್ ಅಪ್ ಮೆಡಿಕಲ್ ರಿಸರ್ಚ್‌ನಿಂದ ಅನುದಾನ ದೊರೆತಿದೆ.

ಮೇ ತಿಂಗಳ 9-12ವರೆಗೆ ನೆದರ್‌ಲ್ಯಾಂಡ್‌ನ ರಾಟರ್‌ಡಾಮ್ ನಲ್ಲಿ ನಡೆದ ಅಂತಾರಾಷ್ಟ್ರೀಯ ಅಟಿಸಂ ಸಂಶೋಧನೆಯ ವಾರ್ಷಿಕ ಸಭೆಯಲ್ಲಿ ಈ ಸಂಶೋಧನೆಗೆ ಐಸಿಎಂಆರ್ ಮತ್ತು ಇನ್ಸಾರ್‌ನಿಂದ ಅನುದಾನ ದೊರೆತಿದೆ. ಡಾ.ಶ್ಯಾಮ್ ಎಸ್.ಭಟ್ ಮತ್ತು ಸಂಶೋಧನಾ ವಿದ್ಯಾರ್ಥಿ ಭುವನೇಶ್ ಸುಖಲಾಲ್ ಕಲಾಲ್ ವಾರ್ಷಿಕ ಸಭೆಯಲ್ಲಿ ಭಾಗವಹಿಸಿ ಸಂಶೋಧನೆಯನ್ನು ಪ್ರಸ್ತುತಪಡಿಸಿದ್ದರು.

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## ವೈದ್ಯರ ತಂಡಕ್ಕೆ ಅಂತಾರಾಷ್ಟ್ರೀಯ ಗೌರವ



ಸಂಶೋಧನೆಯನ್ನು ಪ್ರಸ್ತುತಪಡಿಸಿದ ಯೇನಪೊಯ ವೈದ್ಯರು.

**ದೇರಳಕಟ್ಟಿ** ಮೇ 19: ಯೇನಪೊಯ ಡೆಂಟಲ್ ಕಾಲೇಜಿನ ಉಪ ಪ್ರಾಂಶುಪಾಲ ಹಾಗೂ ಮಕ್ಕಳ ದಂತ ವಿಭಾಗದ ಮುಖ್ಯಸ್ಥ ಡಾ|| ಶ್ಯಾಮ್ ಎಸ್. ಭಟ್ ಮತ್ತು ಅವರ ತಂಡಕ್ಕೆ 'ಆಟಿಸಂ ಮಕ್ಕಳಲ್ಲಿ ಐಜಿಜಿ4' ಪ್ರಮಾಣ ಎಂಬ ಸಂಶೋಧನೆಗೆ ದೆಹಲಿಯ ಇಂಡಿಯನ್ ಕೌನ್ಸಿಲ್ ಆಫ್ ಮೆಡಿಕಲ್ ರಿಸರ್ಚ್ ನಿಂದ ಅನುದಾನ ದೊರೆತಿದ್ದು, ಅಂತಾರಾಷ್ಟ್ರೀಯ ಗೌರವಕ್ಕೆ ಪಾತ್ರವಾಗಿದೆ.

ಮೇ ತಿಂಗಳ 9-12 ವರೆಗೆ ನೆದರ್‌ಲ್ಯಾಂಡ್‌ನ ರಾಟರ್‌ಡ್ಯಾಮ್‌ನಲ್ಲಿ ನಡೆದ ಅಂತಾರಾಷ್ಟ್ರೀಯ ಆಟಿಸಂ ಸಂಶೋಧನೆಯ ವಾರ್ಷಿಕ ಸಭೆಯಲ್ಲಿ ಈ ಸಂಶೋಧನೆಗೆ ಐಎನ್‌ಎಸ್‌ಆರ್ ಮತ್ತು ಐಸಿಎಂಆರ್‌ನಿಂದ ಅನುದಾನ ದೊರೆತಿದೆ.

ಡಾ|| ಶ್ಯಾಮ್ ಎಸ್. ಭಟ್ ಮತ್ತು ಸಂಶೋಧನ ವಿದ್ಯಾರ್ಥಿ ಭುವನೇಶ್ ಐಎನ್‌ಎಸ್‌ಆರ್ ವಾರ್ಷಿಕ ಸಭೆಯಲ್ಲಿ ಭಾಗವಹಿಸಿ ಸಂಶೋಧನೆಯನ್ನು ಪ್ರಸ್ತುತಪಡಿಸಿದರು. *Recognition for autism research*

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