

# **Epidemiology of Wheezes and Diagnosed Asthma among Schoolchildren Aged 12-17 Years in three States of Sudan 2016**

## **Abstract**

Background: There is a dearth of information on wheezes and Asthma in Sudan. Asthma is a non-communicable disease that affected more than 300 million persons in 2014 and contributed to more than 15 million DALYs and 180000 deaths/year.

Objectives: This study was conducted to determine the prevalence of wheezes and asthma in schoolchildren in three states of Sudan.

Materials and methods: Three states of Sudan were selected for field training of the fifth year medical students as part of the curriculum. A two stage sampling procedure was carried out. In the first stage 17 areas were randomly selected from the three states and in the second stage random selection of one primary school for girls and one for boys from each area was done. The eligible study population was children at 7<sup>th</sup> and 8<sup>th</sup> grades of primary schools . The sample size was 1598 schoolchildren. An adapted questionnaire from the international study of asthma and allergies in children (ISAAC) was used to collect the data.

Results: A total of 1598 schoolchildren of the 7<sup>th</sup> and 8<sup>th</sup> grades, aged 12-17 years were enrolled in the study, 349(21.8%) have past experience of an episode of wheezes during the last 12 months prior to the study. Males were 162(46.4%) and females were 187(53.6%). The children' fathers working as freelancers accounted to 259(74.2%) and house wives mothers were 270(77.4%). Both fathers and mothers had high literacy rates 1468(92%) and 1377(86%) respectively. Out of the 349 children who have ever experienced an episode of wheezes during the last 12 months prior to the study, 200(57.3%) of them experienced sleep disturbance. 211(60.7%) experienced difficulty of breathing during play and 183(52.7%) during speech. Those who experienced cough without flue or chest infection were 211(60.7%). The prevalence of diagnosed asthma among the schoolchildren in the three states (n=1598) was 12.5%. Presence of smokers and having trees in the households of the children were significantly associated with an episode of wheezes.

Conclusions: The prevalence of wheezes and asthma in the schoolchildren is high in Sudan. These results are comparable with those of high prevalence results reported worldwide using ISAAC. This demonstrates that asthma is an important health problem in Sudan as well as it is worldwide.

Key words: Epidemiology, prevalence, wheezes, asthma, schoolchildren, Sudan

## **Introduction**

Globally; asthma affected more than 300 million of the population in 2014 [1].Its prevalence is increasing up to 9.5% from 2005 to 2015 for both sexes and all ages. It is estimated that

4.3% of the population are affected with asthma by annual estimate of 9.5% among children [2]. Asthma as a non-communicable disease contributed to more than 15 million DALYs and 180,000 deaths per year [3]. The deaths due to asthma represents more than 1% of the global burden of diseases worldwide with an increase prevalence each decade by more 50% [3]. Two decades ago, it was shown the prevalence of asthma among children was 7.3% in Bangladesh in South Asia region [3]. In USA, the prevalence of asthma among children was 9.6 % with the highest rate (13.5 %) among low-socio-economic status population [4]. Asthma contributed to an increase of the ratio of observed years lived with disability (YLDs) to the expected YLDs by 1.18 in Sudan [5]. During the last decade in Khartoum State; the prevalence of wheezes and severe asthma among school children aged 13-14 years were 12.5% and 5.5% respectively [6]. Studies regarding epidemiology of asthma were few in African countries as well as in Sudan [7]. Little epidemiological information about asthma in childhood is available as well as the management to support reduction in childhood morbidity and mortality [8]. Knowledge of epidemiology of wheezes and diagnosed asthma among school children is almost deficient in the recent literature regarding children in the states of Sudan. The aim was to study the epidemiology of asthma and environmental risks among children of primary schools in the 7<sup>th</sup> and 8<sup>th</sup> grades in three States of Sudan during November 2016.

## Material and Methods

A cross section study was designed to study the epidemiology of asthma among children in primary schools.

**The study area:** Three States of Sudan were selected for field training of medical students. The states were Gazera, White Nile and Northern States. The three states were divided

geographically to several localities. Gazera State had seven localities; White Nile State had six localities and Northern State had four localities. Localities were further divided functionally to administrative units at each state.

**The study population:** The eligible study population was children at 7<sup>th</sup> and 8<sup>th</sup> grades of primary schools.

### **Sampling and sample size**

Two stage sampling procedure was carried out. The first stage of the sampling method was by random selection of 17 areas from the 17 localities in the three states. The second stage of sampling was random selection of one primary school for girls and one for boys from each area. This was resulted into 34 primary schools (17 girls and 17 for boys). Finally total coverage of the eligible children was done and this mounted to (1598) child.

### **Tools and data collectors**

Structured pre coded and pre-tested questionnaire was designed by the department of community medicine – faculty of medicine – University of Khartoum. The questionnaire variables were adapted from the international study of asthma and allergies in childhood Phase I (ISAAC) [9]. It included complain of wheezes and its effect on the child sleep, speech and play during last 12 months prior to the study and the environmental risks. The data collectors were medical students as part of the rural field training curriculum. Ethical clearance and permission were obtained from the Department of Community Medicine, Faculty of Medicine and the states` authorities. Data was cleaned and managed by the software SPSS version 20. Descriptive statistics was presented and chi square test at 95% CL was used to test for risk factors associated with the presence of wheezes

## Results

Out of 1598 children, 349 (21.8%) children had ever experienced an episode of wheezes during last 12 months prior to the study [Fig 1]. Almost two thirds 222 (63.6%) experienced more than one episode of wheezes and 127(36.4%) had only one episode [Fig 1]. The age of the total eligible children in the study ranged between 12-17 years with the mean  $13.3 \pm 1.1$  years [Table 1]. The younger children who had ever an episode of wheezes during last 12 months prior to the study accounted to 229 (65.6%) out of children who experienced wheezes (349) [Table 1].

The gender distribution of the children with wheezes was 162 (46.4%) males and 187(53.6%) females [Table 1]. Children`s fathers who were working as freelancers accounted to 259(74.2%) and housewives mother were 270(77.4%)[Table1]. Both fathers and mothers had high literacy rates, 325(93.1%) and 301(86.2%) respectively [Table 1]. Out of 349 children with wheezes, 200(57.3%) experienced sleep disturbances because of wheezes [Fig 2]. Children who experienced difficulties of play or speech because of wheezes accounted to 60.7% and 52.7% respectively [Fig 3]. The children who were having cough without flue or chest infection during last 12 months accounted to 60.7% [Fig4].The prevalence of diagnosed asthma in the total study children was (199) 12.5% which accounted to 57% of the children who experienced wheezes [Fig 5]. Presence of smokers and trees in the households of the children are significantly associated with an episode of wheezes, p-values 0.001 and 0.005 respectively [Table 2].

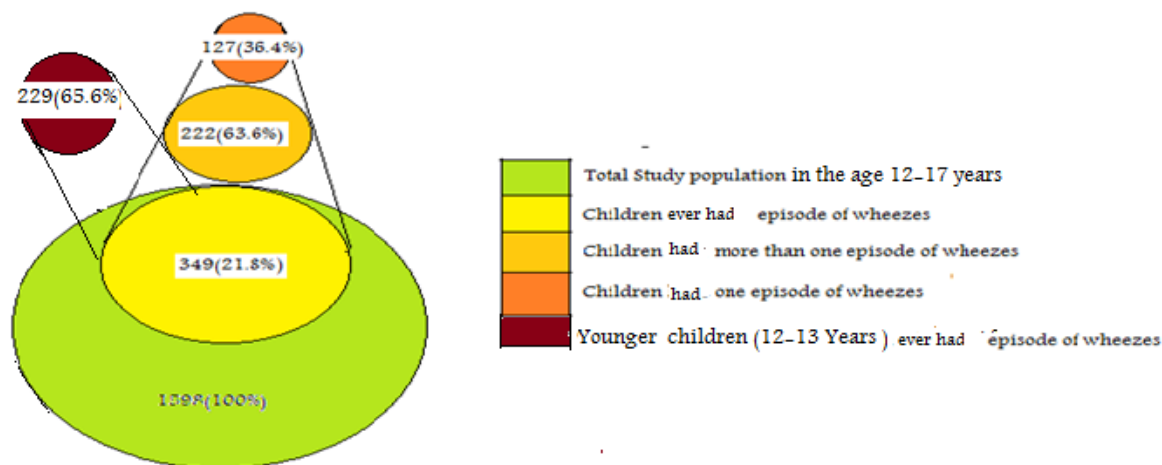


**Figure 1: Prevalence of wheezes during last 12 months prior to the study among children aged 12-17 years at three States of Sudan 2016**

**Table 1: Characteristics of study children aged 12-17 years with and without wheezes at three States of Sudan 2016 (n=1598)**

| Characteristics                  |                  | An episode of wheezes during Total last 12 months prior to study |             |             |
|----------------------------------|------------------|------------------------------------------------------------------|-------------|-------------|
|                                  |                  | Yes (n=349)                                                      | No (n=1249) |             |
| <b>Gender of the child</b>       | Male             | 162(46.4%)                                                       | 576(46.1%)  | 738(46.2%)  |
|                                  | Female           | 187(53.6%)                                                       | 673(53.9%)  | 860(53.8%)  |
| <b>Age Groups of children*</b>   | 12-13 Years      | 229(65.6%)                                                       | 816(65.3%)  | 1045(65.4%) |
|                                  | >13-17 Years     | 120(34.4%)                                                       | 433(34.7%)  | 553(34.6%)  |
| <b>Occupation of the fathers</b> | Employee         | 69(19.8%)                                                        | 269(21.5%)  | 338(21.2%)  |
|                                  | Freelancer       | 259(74.2%)                                                       | 925(74.1%)  | 1184(74.1%) |
|                                  | Not working      | 21(6.0%)                                                         | 55(4.4%)    | 76(4.8%)    |
| <b>Occupation of the mothers</b> | Housewife        | 270(77.4%)                                                       | 1006(80.5%) | 1276(79.8%) |
|                                  | Employee         | 49(14.0%)                                                        | 153(12.2%)  | 202(12.6%)  |
|                                  | Freelancer       | 30(8.6%)                                                         | 90(7.2%)    | 120(7.5%)   |
| <b>Education of the Father</b>   | Illiterate       | 24(6.9%)                                                         | 106(8.5%)   | 130(8.1%)   |
|                                  | Khalwa/primary   | 93(26.6%)                                                        | 381(30.5%)  | 474(29.7%)  |
|                                  | Secondary        | 133(38.1%)                                                       | 458(36.7%)  | 591(37.0%)  |
|                                  | University/above | 99(28.4%)                                                        | 304(24.3%)  | 403(25.2%)  |
| <b>Education of the Mother</b>   | Illiterate       | 48(13.8%)                                                        | 173(13.9%)  | 221(13.8%)  |
|                                  | Khalwa/primary   | 85(24.4%)                                                        | 376(30.1%)  | 461(28.8%)  |
|                                  | Secondary        | 138(39.5%)                                                       | 487(39.0%)  | 625(39.1%)  |
|                                  | University/above | 78(22.3%)                                                        | 213(17.1%)  | 291(18.2%)  |

\*The mean age 13.3±1.1

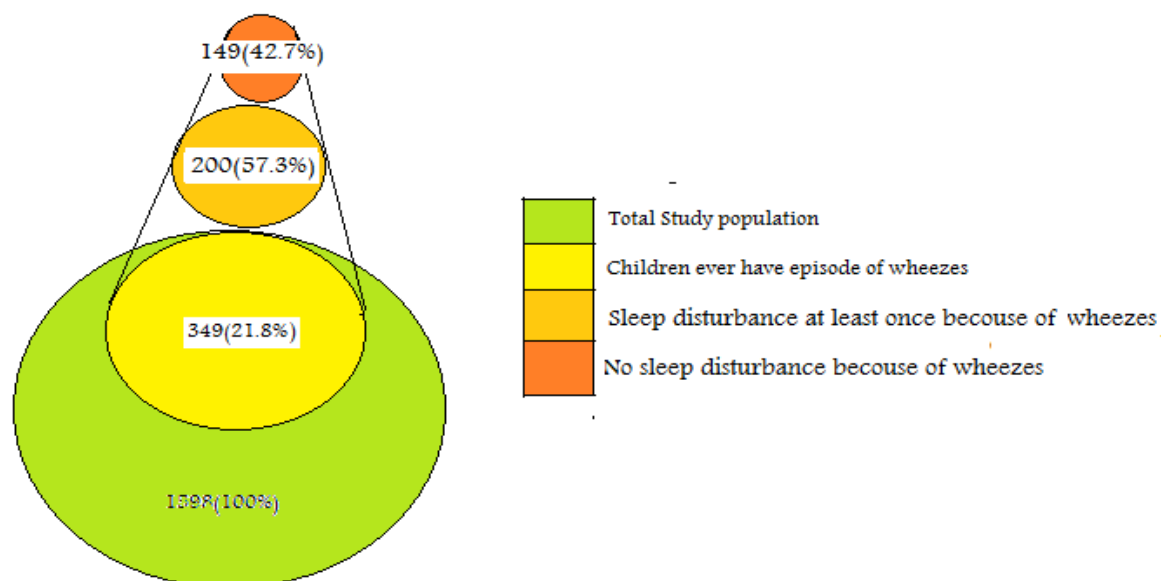


**Figure 2: Prevalence of sleep disturbance because of wheezes among children aged 12-17 years who experienced episodes of wheezes during last 12 months prior to the study at three States of Sudan 2016**

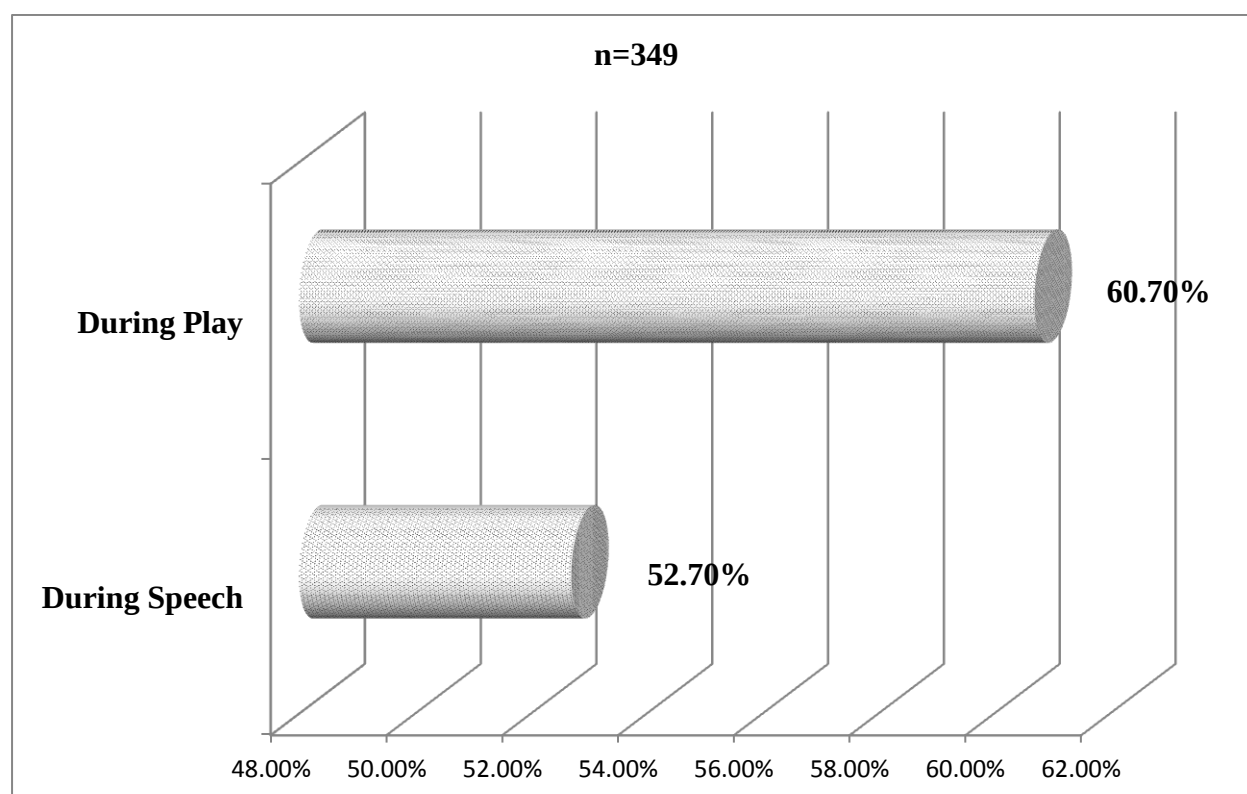


**Figure 3: Prevalence of difficulty of breathing during playing and speech because of wheezes among children aged 12-17 years who experienced episode of wheezes during last 12 months prior to the study at three States of Sudan 2016**

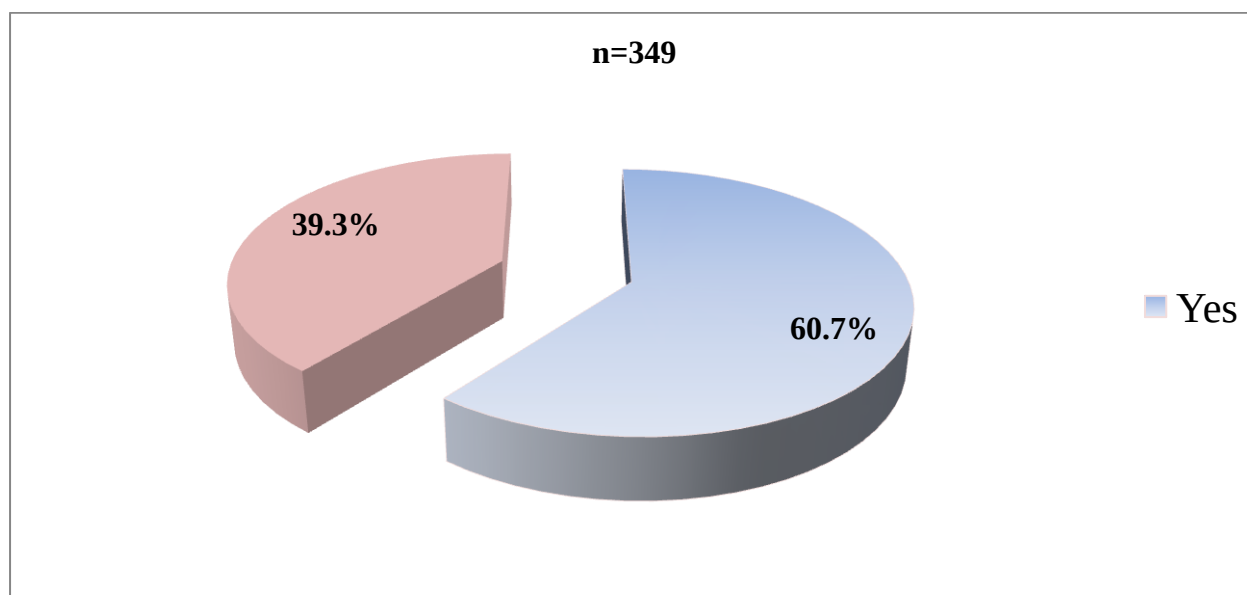


**Figure 4: Prevalence of dry cough without flu or chest infection among children aged 12-17 years who experienced episode of wheezes during last 12 months prior to the study at three States of Sudan 2016.**

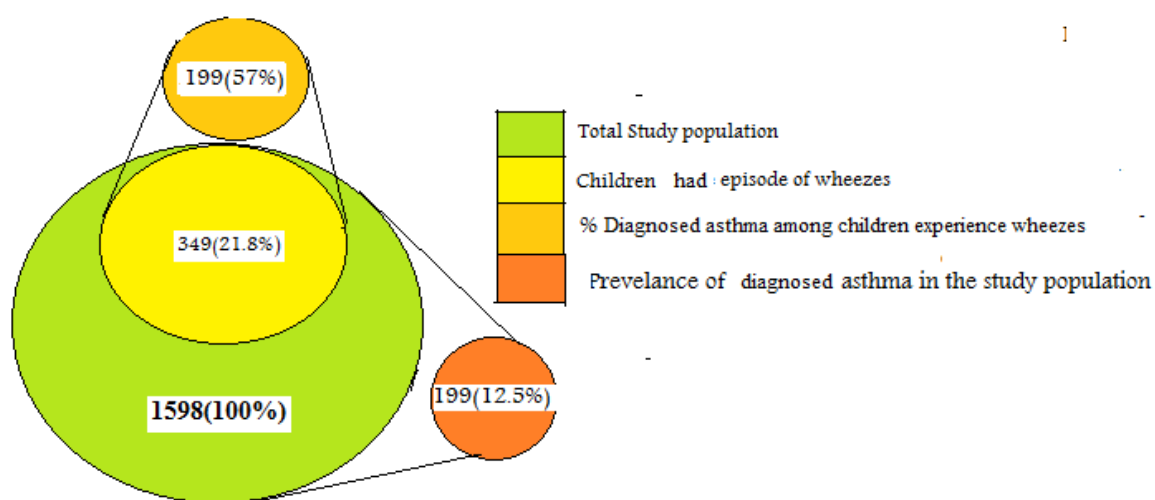


**Figure 5: Prevalence of diagnosed asthma among children aged 12-17 years at three States of Sudan 2016**

**Table 2: Environmental risks associated with wheezes among children aged 12-17 years at three States of Sudan 2016 (n=1598)**

| Risks of having wheezes                                                      |     | An episode of wheezes during last 12 months prior to study |             | P-value* |
|------------------------------------------------------------------------------|-----|------------------------------------------------------------|-------------|----------|
|                                                                              |     | Yes (n=349)                                                | No (n=1249) |          |
| Presence of smokers in the house (in rooms and household yards) <sup>®</sup> | Yes | 154(44.1%)                                                 | 390(31.2%)  | 0.001    |
|                                                                              | No  | 195(55.9%)                                                 | 859(68.8 %) |          |
| Availability of trees inside the house or the surroundings                   | Yes | 262(75.1%)                                                 | 839(67.2%)  | 0.005    |
|                                                                              | No  | 87(24.9%)                                                  | 410(32.8%)  |          |
| Availability of animals inside the house                                     | Yes | 237(67.9%)                                                 | 801(64.1%)  | 0.205    |
|                                                                              | No  | 112(32.1%)                                                 | 448(35.9%)  |          |

\*Fisher exact test

<sup>®</sup> Presence of smoker in the house was significantly a risk associated with more than one episode of wheezes

## Discussion

An adapted questionnaire from the international study of asthma and allergies in childhood phase I (ISAAC) was used. One fifth (21.8%) of the schoolchildren experienced an episode of wheeze during the last 12 months. This result is similar to some findings in previous studies where the prevalence of wheeze was (20%) in both Germany [10] and Hong Kong [11]. It is slightly more than that seen in Ethiopia where it was (18.2%)[12]. It is clearly more than that found in a previous study in Khartoum State, Sudan, where it was (12.5%)[6], Rural India (8.4%)[13], and Ankara, Turkey(4.7%)[14]. However the prevalence in this study is less than what was found in Australia (30%), England (29%) and New Zealand (28%) [10]. These variations in the prevalence of wheezes among countries may result from geographical, seasonal, racial and cultural differences. The increase of the prevalence of wheezes in the three states covered by the study from that of Khartoum State may also be due geographical and seasonal factors, with different exposure to risk factors for wheezes and asthma. These results showed that there are national as well as international similarities on differences in the prevalence of wheezes.

With regard to the prevalence of asthma it was (12.5%) in this study which is similar to that seen in Hong Kong (11%) [11], but more than what was found in Turkey (8.1%)[14], Khartoum State (5.5%)[6] and Ethiopia(2.8%)[1]. The differences in the prevalence of asthma within the country and among countries may be due to geographical, ethnical, exposure risk factors, diagnosis and management of asthma.

Concerning associated symptoms with asthma, (52.5%) of those experienced an episode of wheezes had sleep disturbance. This is more than seen in rural India (17.8%)[13] and Ethiopia (6.4%)[12]. Difficulty breathing during play was experienced by (60.7%) of them. While (52.7%) of them experienced difficulty breathing during speech, greatly more than what was seen in Ethiopia (7.3%) [12]. Cough was experienced by (60.7%) twice more than what was seen in Ethiopia (27.3%) [12].

With regard to risk factors, passive smoking was found to be a risk factor for the occurrence of wheezes, the same was found in the Turkey study [14]. The availability of trees inside the house or the surroundings is a significantly associated risk factor for wheezes in children.

# Limitations

Since the information in this study was obtained by a questionnaire, this may result in recall bias.

Furthermore the three Sudanese States selected were those involved in the Rural Residency program for the 5<sup>th</sup> year medical students, therefore the results obtained could not be generalized to the whole country.

In summary this study shows that the prevalence of wheezes and asthma in Sudan is high, and is comparable to the prevalence of wheezes and asthma reported worldwide. It is a major health problem and more studies are recommended to further explore it in the country. That will greatly help in preventing and controlling the occurrence of wheezes and asthma which will reduce the sufferings of the schoolchildren affected and their families.

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