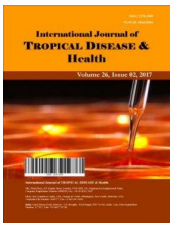

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Prevalence of Wheezes and Asthma among Preschool Children (1-6 Years) in Rural Sudan 2016

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Authors' contributions

This work was carried out in collaboration between all authors. Authors SH and SAB designed the study, wrote the protocol, performed the statistical analysis and wrote the first draft of the manuscript. Author TAEE and other authors managed the literature searches. Authors SH and SAB revised the final manuscript for the scientific and intellectual content. All authors read and approved the final manuscript

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ABSTRACT

Background: Asthma has increased in many countries over recent years and there is little information regarding the prevalence of current wheezing episodes and asthma among preschool children in rural areas of Sudan.
Objective: To identify the prevalence of current wheezes, diagnosed asthma and risk factors among preschool children in rural Sudan.
Materials and Methods: A cross section study was carried out in seventeen rural areas that were randomly selected from three states in Sudan. The eligible study population was preschool children 1-6 years of age. A total of 3352 preschool children from 890 households (3-5 children per

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household) were included in the study. A questionnaire adapted from the international study of asthma and allergies in children (ISAAC) was used. Descriptive statistics was presented and chi-square test at 95% CL was used to test the associations of current wheezes, asthma and risk factors.

Results: There were 1633 males (48.7%) and 1719 females (51.3%) with mean age 4.03±1.83 years. Children who ever had wheezing episode were 684(20.4%) and those who had current wheeze accounted to 558 (16.6%). Children who were diagnosed with asthmatic by a doctor were 233 (7.0%). Sex was associated with current wheezes in favour to male preschool children than females, 299 (53.6%) and 259 (46.4%) respectively, p-value 0.014. Difficulty in sleep, speech and play because of current wheezing episodes were found in 172(30.8%), 274(49.1%) and 281 (50.4%) preschool children respectively. Preschool children who experienced any type of allergy (respiratory or skin) and cough without flu or chest infection during the last 12 months accounted to 200 (36.0%) and 371 (66.5%) respectively.

Presence of smokers, animals and fumes in the households of preschool children were significantly associated with wheezing episodes, p-values 0.014, 0.014 and 0.001 respectively. There was also a significant association between being diagnosed with asthma and the presence of smokers, fumes and trees in the households, p-values 0.022, 0.039 and 0.020 respectively.

Conclusions: The prevalence of wheezes and asthma among preschool children in rural Sudan is alarming. Smoking, fumes and animals were significantly associated with wheezes. Strengthening of asthma prevention and control in rural Sudan and raising community awareness are recommended.

Keywords: Prevalence; risk factors; wheezes; asthma; preschool children; rural Sudan.

1. INTRODUCTION

Asthma is a common chronic non-communicable disease that affects approximately 334 million people of all ages in all parts of the world [1]. It is estimated that 4.3% of the population globally are affected by asthma by annual estimate rate of 9.5% among children [2,3]. Asthma is a risk factor for chronic obstructive pulmonary disease, it is responsible of more than 15 million DALYs and its deaths estimated at 180,000 deaths per year [2,4]. It was found that asthma related mortality (ARM) and asthma prevalence had an inverse relationship and that developing countries compared to developed countries experienced high ARM despite having lower asthma prevalence. The increased ARM in developing countries may be due to lack of education and uneven distribution of resources [5]. Asthma impairs the quality of life of children and their families and incurring high costs to the health care system and society [6]. Worldwide a high population (29.6%) of preschool children suffered from wheezing and (16.9%) suffered from recurrent wheezing, especially in the first three years of life [7]. Preschool children who suffer of wheezes or dry nocturnal cough at the age below 6 years are potentially developing severe asthmatic attacks at school age that need hospitalisation [8,9]. Preschool children are prone to have episodes of breathlessness or wheezing particularly during the first 2 years of life showing an estimate of 50% infants having the episodes [10].

A follow-up study among preschool Dutch children showed 42.7% prevalence of asthma at six years of age [11]. Asthma studies among preschool children in Sudan were not adequately documented. Therefore, studying epidemiology of preschool children wheezes and asthma in Sudan could augment the strategic plans and control programs of non-communicable disease. This study was aiming to identify the prevalence of current wheezes, asthma and risk factors among preschool children in the rural Sudan during Nov 2016.

2. MATERIALS AND METHODS

A cross-section community-based study was designed for the study.

2.1 The Study Area

Three rural states of Sudan were selected for the study. The states were Gazera, White Nile and the Northern States. Seventeen rural areas were selected from the three states for the community-based study targeting households.

2.2 The Study Population

The eligible study population was preschool children age 1–6 years in the 17 rural areas.

Mothers of the preschool children were interviewed for their children.

2.3 Sampling and Sample Size

One administrative unit was selected randomly from each locality amounting to 17 administrative units representing rural areas. A total 890 households (3-5 children per household) were included in the study giving up 3352 preschool children.

2.4 Tools and Data Collectors

Structured pre-coded and pre-tested mini questionnaire was used. It was derived from the published articles of international study of asthma and allergy in children (ISAAC) [12]. It included the variables regarding current wheezing episodes during the last 12 months prior to the study and its effect on the child sleep, speech and play. It also included the possible risk factors, if the child was diagnosed as asthma or has a complaint of any type of allergy in the respiratory system or the skin. Regarding data collection; the fifth year medical students were carrying the interviews at the household level as part of rural field training credit hours that incorporated in the curriculum. Ethical clearance was obtained from the Department of Community Medicine, Faculty of Medicine University of Khartoum and permission was taken from states` authorities. Data was cleaned and managed by the software SPSS version 20. Descriptive statistics were presented and chi-square test at 95% CL was used to test for risk factors associated with the presence of wheezes.

3. RESULTS

The total preschool children in the study were 3352, males were 1633(48.7%) and females were 1719(51.3%) with mean age of 4.03 +1.83 years. Prevalence of wheezes in the study population was 684(20.4%) [Fig. 1]. Current wheezes (episodes during the last 12 months prior to the study) accounted to 558(16.6%) among study preschool children [Fig. 1]. Preschool children who experienced one episode of wheezing were 184 (33.0%) and 374 (67.0%) experienced more than one episode [Fig. 1]. The prevalence of diagnosed asthma among the study preschool children was 7.0% and 34.1% among who ever had wheezing episode [Fig. 2].

Prevalence of sleep, speech and play difficulties because of current wheezing episodes were 172(30.8%), 274(49.2%) and 281(50.4%) respectively [Fig. 3]. Prevalence of allergy of respiratory tract and /or in the skin and dry cough without flu or chest infection among study population accounted to 200 (36.0%) and 371 (66.5%) respectively [Fig. 4].

Presence of smokers, domestic animals and fumes in the households of preschool children were significantly associated with an episode of wheeze, p-values 0.014, 0.014 and 0.001 respectively [Table 1]. Diagnosed asthma was significantly associated with presence of smokers, trees and fumes in the households of preschool children, p-values 0.022, 0,020 and 0.039 respectively [Table 2].

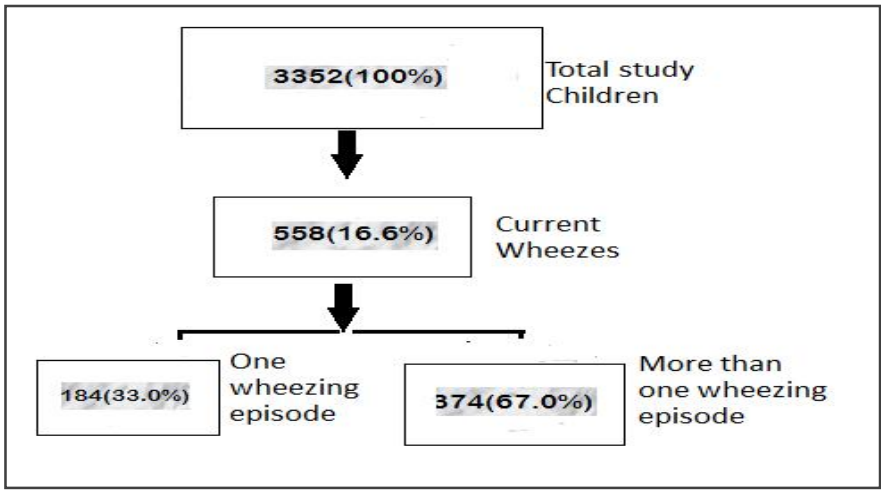

Fig. 1. Prevalence of wheezing episodes among preschool children in rural Sudan 2016

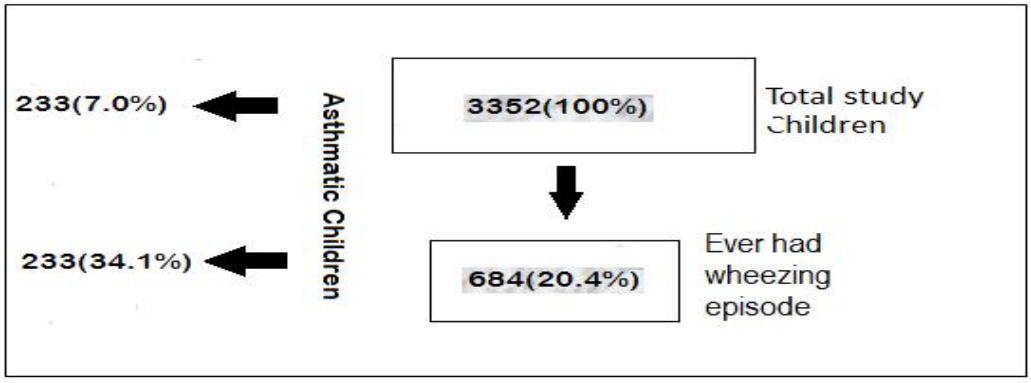

Fig. 2. Prevalence of diagnosed asthma among preschool children in rural Sudan 2016

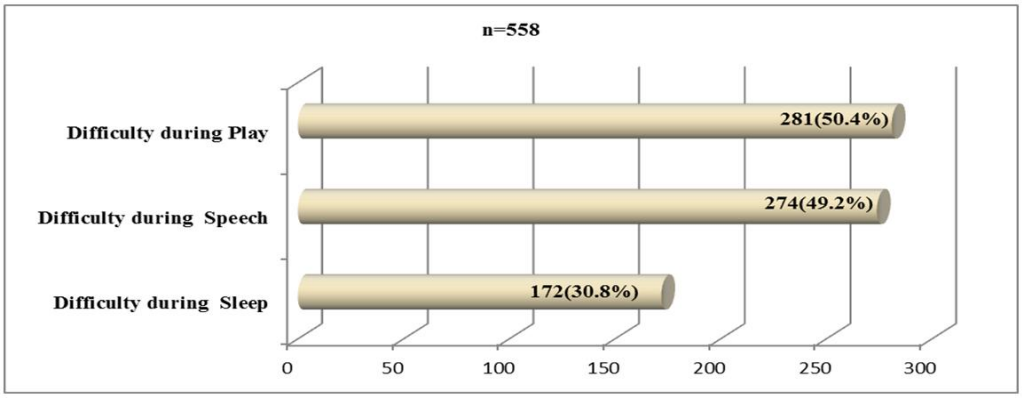

Fig. 3. Preschool children experienced difficulties during sleep, speech and play because of current wheezing episodes in rural Sudan 2016

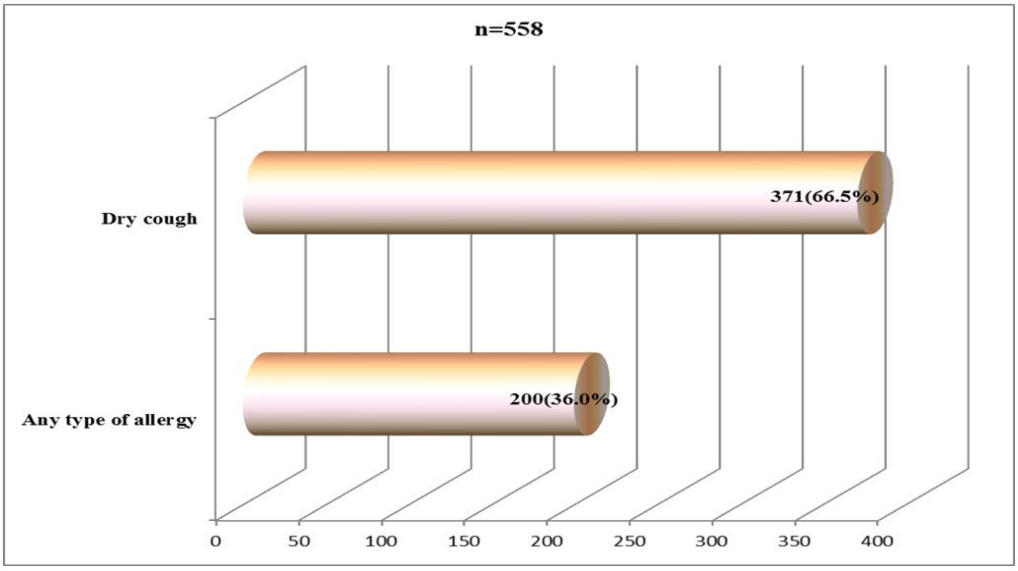

Fig. 4. Preschool children experienced allergy and dry cough without flu or chest infection in last 12 months prior to the study in rural Sudan 2016

Table 1. Environmental risks and wheezes among preschool children in rural Sudan 2016 (n=3352)

Risks of having wheezes		Current wheezing episodes		
		Yes (n=558)	No(n=2794)	p-value
Presence of smoking (in rooms and household yards)	Yes	162 (29.0%)	693 (24.9%)	0.014
	No	396 (71.0%)	2101 (75.1%)	
Availability of trees inside house or the surroundings	Yes	356 (64.0%)	1655(59.2%)	0.127
	No	202 (36.0%)	1139(40.5%)	
Availability of Animals inside the house or surroundings	Yes	343 (61.0%)	1531 (54.8%)	0.014
	No	215 (39.0%)	1263 (45.2%)	
Presence of fumes inside the house or surroundings	Yes	261 (47.0%)	891 (31.9%)	0.001
	No	297 (53.0%)	1903 (68.1%)	

Table 2. Environmental risks and asthma in preschool children in rural Sudan 2016 (n=3352)

Risks of having asthma		Diagnosed asthma in preschool children below 7 years of age		
		Yes (n=233)	No(n=3119)	p-value
Presence of smoking (in rooms and household yards)	Yes	73 (31.3%)	782(25.1%)	0.022
	No	160 (68.7%)	2337(74.9%)	
Availability of trees inside house or the surroundings	Yes	155(66.5%)	1856(59.5%)	0.020
	No	78 (33.5%)	1236(40.5%)	
Availability of Animals inside the house or surroundings	Yes	139 (59.7%)	1735(55.6%)	0.130
	No	94 (40.3%)	1384 (44.4%)	
Presence of fumes inside the house or surroundings	Yes	93 (39.9%)	1059 (34.0%)	0.039
	No	140 (60.1%)	2060 (66.0%)	

4. DISCUSSION

In this study, 20.4% of the preschool children had ever experienced an episode of wheeze and current episodes of wheezes accounted to 16.6%. This current prevalence of wheezes in preschool children in Sudan was more than that seen in Italy (12.1%) [13] and Ethiopia (3.4%) [14]. However, these variations may be due to different exposure to environmental risk factors, different settings and different methodological approaches used. Wheezing and asthma among preschool children were possibly preceded by poor exclusive breastfeeding pattern and chronic malnutrition that might explain the current wheezes rate in this study [15,16]. In Sudan ever breastfeeding indicator was optimum (95.6%) but exclusive breastfeeding for six months (55.4 %) and continued breastfeeding at 2 years (48.8%) were poor [17]. Micronutrient malnutrition has a role in the development of wheezes episode among children. It was found that sufficient vitamin D content, promotes a protective role, particularly if the mother received adequate vitamin D consumption during pregnancy [18,19]. Furthermore, it was documented that certain predictive factors such as female gender, positive skin prick test (SPT) and late-onset preschool wheeze index are associated with a higher chance of asthma patients being hospitalised after the age of 6 years [8].

This study showed that 7% of study preschool children were having diagnosed asthma compared to 34% among who ever had wheezing episodes. Almost all developing countries had prevalence rates ranged between 5% to less than 20% compared to developed ones which had less than 5% prevalence [20]. However, the prevalence of diagnosed asthma among preschool children in Sudan was more than that in Tanzania (2.1%) [21] and less than that seen in Italy (8.6%) [13] and Australia (18% in Wagga Wagga and 22% in Lismore) [22]. Again these differences may be due to different exposures, different settings, in addition to differences in diagnosis and management among countries. Half of the preschool children had disturbed sleep, experienced difficulties during speech and nearly one third of them experienced difficulty playing. Children living with some daily life restrictions affect the psychological well-being, cognitive abilities and the academic achievement [23, 24]. Lack of playing and poor physical activity had an increased risk of developing new-onset asthma attacks and

wheeze [25]. Available evidence indicates that physical activity is a possible protective factor against asthma development [26]. Previous studies showed that the relationship between asthma and sleep disordered breathing (SDB) seems to be bidirectional that may deleteriously affect each other [27,28]. It was found that sleep disturbance, allergic infections, and Attention Deficit Hyperactivity Disorder are associated with childhood asthma and these disturbances may affect the neurocircuitry involved in speech and language and increased the risk of childhood speech disorders [29].

In this study, presence of smokers, domestic animals and fumes inside the house or surroundings are significantly associated with wheezes and availability of trees inside house or the surroundings is significantly associated with diagnosed asthma. It was shown that grass pollens are associated with asthmatic attacks among children that need admission to emergency rooms [30]. Asthma is a complex disease that has multi dimension risks which include environmental factors and need different approaches for control [31]. Educating the families and affected children about these triggering factors could reduce asthma episodes and its complications.

5. CONCLUSIONS

The prevalence of wheezes and asthma among preschool children in rural Sudan is alarming. Smokers, domestic animals and fumes inside the house or surroundings were significantly associated with wheezes. On the other hand, the availability of trees inside or around the house was significantly associated with diagnosed asthma. Emphasis should be on strengthening of asthma management and control in rural Sudan together with raising community awareness. Moreover, further studies are needed to uncover other risk factors.

6. LIMITATIONS

The states were pre- selected for Rural Residency Program for the 5th year medical students; therefore, the results obtained could not be generalised to the whole country.

ETHICAL APPROVAL AND CONSENT

Ethical clearance was obtained from the Department of Community Medicine, Faculty of Medicine University of Khartoum and consent was taken from states authorities.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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