Urban-rural dichotomy in asthma

Awotedu AA MBBS(Iba), FMCP(Nig), FWACP, FCCP, FCP(SA)
Dept of Internal Medicine, Pulmonology Department Faculty of Health Sciences
University of Transkei, Umtata, Council Member of the National Asthma Education Programme

Correspondence: Fax (047) 502 2235 E-mail: bolaawotedu@yahoo.co.uk. P/Bag X1, Umtata 5100

Asthma is a chronic inflammatory disease of the airways, which is global in spread, affects all ages and both sexes. The prevalence rates vary from country to country and vary even in the same country between urban and rural areas.

Global asthma prevalence

Countries can be divided into those with high prevalence rates - Australia and New Zealand, medium – USA, Canada, UK and most of Western Europe. Low incidence countries are mainly African and Asian countries. Several studies from the developing countries have observed that the prevalence of asthma is lower than in developed countries [1-3]. There is overwhelming data on the increase in prevalence of asthma, morbidity and mortality over the past 4 to 5 decades. This secular trend has been reported by studies all over the world [3].In Britain for example the asthma prevalence increased from 1% in 1947 to 5.4% in 1983 and presently to 6.5%[4]. The current prevalence rate for Australia is 13% and highest in New Zealand - 20%. [5] Studies from Africa have also confirmed rising prevalence rates in most countries. Earlier studies from Gambia found no asthma in the rural population in Gambia [6]. A study of three racial groups in Durban 3 decades ago showed that 0.02% blacks, 0.8% Indian and white children on admission had asthma [7]. However, recent studies have found relatively high prevalence rates in countries such as Kenya 11%, Nigeria 18% and South Africa 6.5%, 10.8%[8,9].

The wide variations in prevalence rates reported in most studies, even within the same geographical area, are partly due to the criteria used for the diagnosis of asthma. Some studies use exercise-induced bronchoconstriction (EIB) for diagnosis of asthma, while others use clinical symptoms such as history of wheeze. The use of EIB is plagued by different cut-off points employed for fall in PEFR or FEV_1, which vary from 10% to 25%[10-12]. This inconsistency in earlier studies is, however, being addressed.

Urban-rural differences in africa

Asthma has been reported to be more common in urban than rural communities in the developing countries. In most rural communities in Africa asthma is virtually unknown while prevalence rates in cities show rates as high as in the developed countries. Studies from African countries show the marked urban-rural differences to vary from one country to another. Most of the studies were in children and used exercise-induced bronchoconstriction (EIB) as a diagnostic instrument in asthma.

An early study from South Africa 23 years ago showed a rate of 0.2% in Xhosa children in rural Transkei compared with 3% in Xhosa children living in Cape Town[13]. The earlier Gambian study referred to above showed that, although no asthma was found in children and adults in a rural area, 50km away in the capital Banjul, many patients were recruited for an asthma study[8]. A study from Ghana showed EIB rates in urban rich children of 4.7%, urban poor children 2.2%, and 1.4% in rural children [14]. The researchers concluded that social and environmental factors such as wealth, lifestyle, and housing might be important contributory factors to the differences observed. A similar study from Zimbabwe showed the urban rich and urban poor rates to be 5.8% and 3.1% respectively, while the rural rate was 0.1%[3]. However, a much higher rate in both urban and rural children was found in a recent Kenyan study: 22.9% urban, and 13.2% rural[15]. Much lower rates were, however, reported from Ethiopia, where the urban prevalence was found to be 1.8% and the rural rate 1.1% in children whose mothers reported wheeze or asthma.[16] This urban/rural difference was also found in a study of school children in Umtata and a rural school 50 km away. Prevalence of 3.9% was encountered in Umtata and 2.1% in the rural.area[17].

Urban -rural difference in developed countries

Studies from developed countries (Australia, UK) have found that children living in rural areas have the same rates of asthma as those in urban areas. In fact a reversal of the picture in developing countries was found in the USA (California) where asthma was reported to be higher in rural areas(27%) than urban areas (22.7%).

Possible reasons for urban-rural dichotomy

The reasons for the urban/rural dichotomy in developing countries and the lack of such in developed counties remain speculative. Some of the factors usually blamed for the increased urban prevalence of asthma include adoption of a western lifestyle and the role of the various trigger factors. The asthma triggers can be either allergic or non-allergic in nature The allergic triggers are: house dust mite, pollen, animals such as dogs and cats, fungal spores and cockroach particles. The non-allergic triggers include smoke, exercise, and pollution from cooking fuels, wood smoke, smog, viral respiratory tract infections and weather changes. All the above triggers are found in both urban and rural environment albeit to different extents. Air pollution is responsible for various respiratory diseases. The pollutants are mainly sulphur dioxide, nitrogen dioxide and ozone. However, the concentration of these gases in most cities in developed countries has reduced remarkably over the past 2 decades. In contrast, industries sited in the cities in most developing countries still have a high level of pollution and may in part explain the high prevalence of asthma in the urban areas compared to the rural areas.

The role of indoor allergens in explaining the urban-rural difference is complex. Children in rural areas live in an environment that is potentially allergenic. They live in mud houses with thatched roofs and are likely to be in close contact with these animals. It is, however, argued that farm animals may not be as allergenic as domestic animals such as dogs and cats which are more likely to live in close contact with their owners in the cities. Allergens such as house dust mite, cockroaches and fungi have an ideal environment in which to proliferate in most houses in urban areas. Thus the dose of allergens is much higher in the urban than in the rural environment. The level of exposure to house dust mite is also different in the urban compared to the rural area. House dust mites are well known to colonise carpets, blankets and mattresses, which are more likely to be used in urban homes than rural ones. Reports on skin sensitivity tests to house dust mite in African studies show rates of 40% from Nairobi and 58% form Nigeria[18] However, none of the studies compared skin sensitivity test results between urban and rural asthmatic patients, something that may be worth looking at. Breast-feeding for longer than one year is believed to be protective against allergic conditions such as asthma. Also the lack of exercise in those living in urban areas is another factor that has been blamed [19] However, the role of early life events, and the time of migration to an urban area are thought to determine the immune response of the child. Children who are born in the urban areas are exposed within the first year of life to a variety of allergens which are speculated to tip the balance of their immune system from a Th1 to a Th2 asthmatic phenotype response[15] What seems to be clear from all of these is that there is a genetic predisposition to the development of asthma. However, environmental factors and lifestyle play a considerable part in altering this genetic disposition, thus causing higher incidence of asthma in persons living in urban areas. Thus no single factor could be advanced for this dichotomy. Most likely a variety of factors at various times and in different circumstances account for the dichotomy.

The urban – rural dichotomy does not end with increased prevalence in urban areas. It is a common observation that the burden of asthma is disproportionately borne by rural communities. This is because of poor access to medical facilities in the rural communities with resultant lateness to present to a health facility. Also of importance is the problem of the unavailability of asthma drugs in rural health facilities. Personal observation shows that in the rural areas of the Transkei drugs available for the treatment of asthma are mainly salbutamol and theophylline tablets. MDIs are not available. It is therefore not surprising that many of the patients with acute severe asthma arrive at the district hospitals in a poor state with consequent high mortality.

References

1. Warrell DA, Fawcett IW,Harrison BDW et all. 1975. Bronchial asthma in the Nigerian Savannah region. Q.J.Med. 44,325-47
2. Keeley DJ, Neill P, Gallivan S. Comparison of the prevalence of reversible airway airway obstruction in rural and urban Zimbabwe children. Thorax 1991; 46: 549-53
3. Clark TJH and Godfrey S in 'Asthma' 2nd Ed. Chapman & Hall
4. Lee DA, et al. prevalence and spectrum of asthma in childhood. Br. Med. J 1983; 286: 1256-8
5. Shaw RA, et al. Increasing asthma prevalence in rural New Zealand adolescent population:1975-1989. Arch Dis Child 1990; 65: 1319-23
6. Godfrey RC, 1975. Asthma and IgE levels in rural and urban communities of the Gambia. Cli. Allergy ,5 201-7
7. Wesley AG, Clyde JH and Wallace HL. Asthma in Durban of three racial groups. S African Med J 1969;43: 87-9
8. Ehrlich RI, Du Toit et al. prevalence and reliability of asthma symptoms in primary school children in Cape Town. Int J Epidemiol 1995; 24:1138-1145
9. ISAAC Steering Committee. Worldwide variations in prevalence of symptoms of asthma, allergic rhinoconjunctivitis, and atopic eczema: ISAAC. Lancet 1998; 351: 1225-1232
10. Godfrey S, Silverman M, Anderson SD, Problems of interpreting exercise-induced asthma J Allergy Cli Immunol 1973; 52: 199-209
11. Burr ML, Eldridge BA, Borysiewicz LK. Peak expiratory flow rates before and after exercise in school children. Arch Dis Child 1974; 49:923-6
12. Cropp GJA, Relative sensitivity of different pulmonary function tests nin the evaluation of exercise induced asthma. Pediatrics 1975;56:860-7
13. Van Niekerk CH et al. prevalence of asthma: a comparative study of urban and rural Xhosa children. Clin Allergy 1979; 9:319-24
14. Addo Yobo EOD et al Exercise induced bronchospasm in Ghana : differences in prevalence between urban and rural schoolchildren Thorax 1997;52:161-5
15. Ng'ang'a LW et al. Prevalence of exercise induced bronchospasm in Kenyan school children: an urban-rural comparison. Thorax 1998;53:919-926
16. Yamaneberhan H, Bekele Z, Venn A, Lewis S, Parry E, Britton J. Prevalence of wheeze and asthma in relation to atopy in urban and rural Ethiopia Lancet 1997;350:85-90
17. Awotedu AA 2001 unpublished data
18. Awotedu AA, Oyejide C, Ogunlesi A, Onadeko BO. Skin sensitivity patterns to inhalant allergens in Nigerian asthmatic patients Cent Afr J Med 1992;38:187-191
19. Weinberg EG Urbanization and childhood asthma in Sub-Saharan Africa