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COMMUNITY ACQUIRED PNEUMONIA AMONG CHILDREN ADMITTED IN A TERTIARY HOSPITAL: THE BURDEN AND RELATED FACTORS

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ABSTRACT

Objective: To find out the hospital burden of pneumonia and preventable factors associated with the disease.

Design: Prospective cross sectional study.

Setting: The paediatric ward of Moi Teaching and Referral Hospital in Western Kenya.

Subjects: All the children admitted to the paediatric wards and found to have clinical features consistent with pneumonia.

Results: One thousand eight hundred and eighty two children were included in the study out of whom pneumonia was responsible for 13.23% and 5.5% of all deaths. Degree of severity was used to classify patients into mild pneumonia, severe pneumonia and very severe pneumonia each group comprised 12%, 70% and 18% respectively. Parents in age group 21 to 25 years (OR 2, CI 1.07 – 3.63) and use of firewood /charcoal (OR 4.23, CI 3.9 – 4.6) were risk factors for mild pneumonia. Unemployment (OR 2.7, CI 2 – 3.2), age group 21 to 25 years (OR 4, CI 1.2 – 6.4) and use of firewood/charcoal (OR 1.1, CI 1.02 – 1.26) were risk factors for severe pneumonia.

Conclusion: Pneumonia accounted for less number of admitted children compared to previous study. Use of firewood or charcoal as source of fuel and mothers in age group 21 – 25 years were independent risk factors for mild pneumonia and severe pneumonia.

INTRODUCTION

In developing countries, where patients are often treated without seeing a doctor, the WHO defines clinical pneumonia simply as an acute episode of cough or difficulty in breathing associated with an increased respiratory rate (1). In the low – income countries, over one quarter of children under five years have an episode of clinical pneumonia each year (2). Every year 1.9 million children under five years of age die from pneumonia (3). On average two to three percent of children each year have pneumonia severe enough to require hospitalisation, and many of these episodes are potentially fatal (4). Approximately 21% of child deaths are due to pneumonia (3), and many developing countries have mortality rates of

60-100 per 1,000 children under five years of age (5); this suggests that for every 1,000 children born alive, 12 - 20 die from pneumonia before their fifth birthdays.

Pneumonia continue to cause high mortality among children less than five years even though effective interventions to manage the condition are available. Attaining reduction of the under five mortality as envisaged in the Millenium Development Goals (MDGs) will remain elusive unless new strategies to improve child health and development are introduced. This study investigated preventable factors that could be targets for public health interventions aimed at preventing severe forms of pneumonia.

MATERIALS AND METHODS

This was a prospective cross sectional study of children aged one year to five years admitted to the paediatric ward of Moi Teaching and Referral hospital (MTRH) in western Kenya over a period of six months. All admitted patients were screened by clinical interview and examination. Those found to have pneumonia were further interviewed by use of a questionnaire to collect demographic data of the parent and child, occupation of the parent, family size, type of house, source of fuel, marital status, immunisation, classification of pneumonia and outcome. Patients with hospital acquired pneumonia were excluded from this study. Pneumonia was defined as presence of cough and increased respiratory rate and further classified into mild pneumonia, severe pneumonia and very severe pneumonia according to the WHO recommendations (1).

The patient's parent or guardian signed informed consent. The research was approved by the Institutional Research and Ethics Committee (IREC) of Moi University and MTRH. Associations of socio-demographic factors with pneumonia were assessed using nominal correlation with $p < 0.05$ considered significant. Significant factors were further analysed by logistic regression.

RESULTS

During the study period a total of 1882 children were admitted to the paediatric wards, out of whom 181 had pneumonia, therefore pneumonia was responsible for 13.23% of hospital admission. One hundred and forty nine patients died out of whom ten were due to pneumonia which translates to 5.5% of all deaths.

Demographic factors: Eighty four (46%) of the children were below one year while 63(35%) and 34(19%) were one to two years and above two years respectively. One hundred and twenty one (66.7%) of them were fully immunised in accordance with the Kenya divisional immunisation schedule for children. The ones who were not fully immunised were mainly those who had not attained the age for full immunisation. The age of parents ranged from 21 to 40 years and 59.1% of them were in the age group 21 to 25 years (Table 1). All the parents had gone to school with majority of them (54%) having attained secondary education. Forty seven percent of parents were unemployed while only 24% were in formal employment. Majority of the families stayed in the informal settlements in the environs of Eldoret (Table 1) where 88% of them came from Langas, Huruma and Kipkaren. In this study family size was categorised as small (less than 5), medium (5 – 10) and large (more than 10) and this accounted for 150 (82.9%), 23 (12.7%) and eight (4.4%) respectively.

Table 1
Demographic factors

Attribute	Frequency (n=181)
Age of patient (years)	
<1	84(46%)
1 – 2	63(35%)
>2	34(19%)
Immunisation status	
Complete	121(66.9%)
Incomplete	60(33.1%)
Age of parent (years)	
21 – 25	68(37.6%)
26 – 30	107(59.1%)
31 – 40	6(3.3%)
Education of parent	
Primary	47(26%)
Secondary	98(54%)
Tertiary	36(20%)
Parents marital status	

Married	94(52%)
Single	60(33%)
Divorced	18(10)
Widowed	9(5%)
Occupation of Parent	
Formal employment	43(24%)
Self employment	53(29%)
Unemployed	85(47%)
Family size	
Small (<5)	150(82.9%)
Medium (5-10)	23(12.7%)
Large (>10)	8(4.4%)
Residence	
Langas	58(32%)
Huruma	52(29%)
Kipkaren	49(27%)
Others	22(12%)

Pneumonia characteristics: All the three degrees of severity of pneumonia were observed with percentage of 12, 70 and 18 for mild pneumonia, severe pneumonia and very severe pneumonia respectively. Parents in age group 21 - 25 years, married parents, small family size, and age of child below one year, were positively associated with the likelihood of having pneumonia. Parent's employment and complete immunisation were negatively associated with pneumonia (Table 2). Independent risk factors for mild pneumonia were

age of parent being 21 to 25 years (OR 2.0; CI 1.07 to 3.63) and use of firewood or charcoal as source of fuel (OR 4.23, CI 3.9 – 4.6). Immunisation status was not a statistically significant independent factor. The factors that increased the risk of severe pneumonia were parent's unemployment (OR 2.7, CI 2 - 3.2), age of parent 21-25 years (OR 4.0, CI 1.2 – 6.4) and use of firewood or charcoal as source of fuel (OR 1.1 CI 1.02- 1.26). Immunisation status did not significantly increase the probability of severe pneumonia.

Table 2
Nonparametric correlations between diagnosis of pneumonia and other variables

Factor	Spearman's RHO
Age of parent (21-25)	0.429**
Educational level (tertiary)	-0.183*
Marital status (unmarried)	0.474**
Occupation (employed)	-0.237**
Size of family (<5 members)	0.232**
Age of child (<1 year)	0.488**
Immunisation (completed)	-0.603**

* p < 0.05

**P<0.01

Table 3
Logistic regression of risk factors of pneumonia

Variable	Odds ratio	95% Confidence interval
Occupation (employed)	7.46	0 – 12
Age of parent (21 – 25)	2.0	1.07 – 3.63
Source of fuel (smoke)	4.23	3.9 – 4.6
Immunisation (completed)	0.6	0.03 – 1.65

Table4
Logistic regression of risk factors of severe pneumonia

Variable	Odds ratio	95% Confidence interval
Occupation (Unemployed)	2.7	2 – 3.2
Age of parent (21 – 25)	4.0	1.2 – 6.4
Source of fuel (smke)	1.1	1.02 – 1.26
Immunisation (complicated)	2.68	0.54 – 13.4

DISCUSSION

Pneumonia together with diarrhoeal disease, malaria, malnutrition and measles contribute over 75% of all deaths in children under five years in developing countries (6). In Kenya pneumonia is among the top three causes of hospital admissions and the top five causes of infant and under five year's mortality (7). In this study the most common age group affected was below one year which supports other studies that have shown this group to bear the highest morbidity and mortality (6). This study only considered admitted patients and therefore considered severe forms of pneumonia. The proportion of children who had received vaccination for pertussis, streptococcal pneumonie, haemophilus influenzae and measles in this study was 66.9% which is comparable to vaccination coverage in the country of 77% (8). The patients seen in this study were predominantly (88%) from informal settlements around the town which suggests that they were from low socio-economic class in line with studies done in similar populations (9,10).

Pneumonia accounted for 13.23% of the total admission for children which is a reduction as compared to the study done by Menge *et al* in the same hospital in 1995 (10), in which pneumonia was responsible for 26.8% of admitted children. This would suggest a gradual decrease in pneumonia over the years perhaps as a result of improvement in healthcare during this period or increase in number of other diseases after the hospital became a referral centre. Increased immunisation coverage and introduction of immunisation against haemophilus influenza tybe B and streptococcus pneumoniae could have contributed.

In this study we identified factors that increased

the risk of pneumonia in children. The risk associated with these factors may be important in identifying possible interventions to reduce the incidence of severe pneumonia. The type of fuel used was the strongest risk factor for pneumonia requiring admission. It is an established fact that air pollution is a risk factor for pneumonia (11,12) and WHO recognises both indoor and outdoor pollution as factors that contribute to incidence of pneumonia. This study supports the hypothesis that reduction of air pollution will significantly reduce cases of pneumonia. In poor socio-economic communities like where our patients came from, providing alternative sources of fuel may be a plausible intervention. However evidence from Parkistan and Brazil indicate that the risk factor attributable to type of fuel may be mitigated by improvement in ventilation (13,14). The current study did not inquire into state of household ventilation. It would be advisable to look into the state of household ventilation in future.

Unemployment and young age group of the mother were other important factors identified in this study. Unemployment directly affects the economic status of the urban poor. This factor must be analysed on the background of the source of income for families who stay in informal settlements and provide cheap labour for urban centres. In Basra and Sudan unemployment was associated with cases of severe pneumonia and as reported in this study it is a strong risk factor for severe pneumonia (15,16). Unemployment may affect child care practice and health seeking behaviour; young age group of the mother notably has higher power in increasing the risk of severe pneumonia as compared to pneumonia. The young mothers have been associated with poor experience in child care practice (11,12). This study

supports findings in other developing countries that children of young mothers are at increased risk of pneumonia (15,16). This may be explained by delay in recognition of sick babies and timely health seeking behaviour.

Immunisation status is a weak risk factor for mild pneumonia but stronger for severe pneumonia. It is well recognised that immunisation against measles, pertussis, haemophilus influenza and streptococcus pneumoniae reduces the risk of pneumonia (12). The observation in this study may be explained by the immunisation coverage in Kenya being high and the fact that immunisation services are free and therefore available to the poor (7). This study suggests that immunisation is more important in prevention of severe form of pneumonia and therefore interventions to increase the coverage may impact more in this group.

In conclusion, pneumonia accounted for less number of admitted children compared to previous study which suggests proportionate reduction in its burden. Use of firewood or charcoal as source of fuel and mothers in age group 21 – 25 years were independent risk factors for pneumonia and severe mild pneumonia, in addition unemployment increased the risk of severe pneumonia.

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