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DETERMINANTS OF IMMUNISATION COVERAGE AMONG CHILDREN IN MATHARE VALLEY, NAIROBI
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N. KAMAU and F. O. ESAMAI

ABSTRACT

Objective: **To establish the factors that determine the levels of immunisation coverage among children under five years in Mathare Valley.**
Design: **A cross-sectional study describing the situation at a point in time.**
Setting: **Mathare Valley slum with a population of 50,000 people in the city of Nairobi.**
Subjects: **The study population was mothers with children under five years in Mathare Valley and had been resident there for a period not less than five years prior to the study.**
Outcome measures: **Level of immunisation coverage among children in the study population and the factors that contribute to the low immunisation coverage.**
Results: **Knowledge on immunisation was high with 90% of the respondents able to define immunisation. The attitude on immunisation was positive (74.4%) and immunisation coverage stood at 62.2%. Age, level of education, attitude and knowledge on immunisation among the residents were significant determinants of immunisation coverage.**
Conclusion: **Immunisation coverage was lower than the national average in Mathare Valley. Advanced mother's age, low level of education and relative lack of knowledge on immunisation were responsible for the low coverage.**

INTRODUCTION

Immunisation, an element of Primary Health Care (PHC) is one of the emphases of Child Health Care. Its systematic application worldwide saw eradication of smallpox in 1977 which prompted WHO to step up its effort in increasing immunisation coverage from 10% in 1974 to 80% in 1990 but has declined to 78% where it has remained steadily(1).

This success unfortunately is not well spread all over the globe with Africa having an average coverage of 60%(2). Measles vaccine (at nine months) has the lowest coverage despite the fact that it causes the greatest morbidity and mortality of all current vaccine preventable target diseases. In 1995, 79% of the world's children were vaccinated for the routine Expanded Programme on Immunisation (EPI) diseases as part of Universal Child Immunisation (UCI). However, a challenge remains to reach the 20% of the children who are still unimmunised. Many of these are among the poorest and the least privileged in their societies(3).

WHO estimates that in 1996, one million children died from measles, more than all the other EPI vaccine preventable diseases combined. Most of these deaths occur in developing countries and globally measles accounts for more than ten per cent of deaths occurring in the age group 0-5 years, half of them in children less than one year. Only 58% of Kenyan children had received measles vaccine by their first birthday in 1998(4,5).

It is probable that a million fatalities are caused annually by neonatal tetanus. In some parts of the world especially the developing countries, tetanus kills more newborn babies than any other factor. This is due to such factors as increased contamination since people have more contact with soil in manual cultivation; poor hygiene especially at childbirth and childcare and maternity services.

Every year, five million children suffer from respiratory complications as a result of pertussis infection, and 50,000 suffer from long-term neurological complications including permanent brain damage. In developing countries the death rate for pertussis can exceed fifteen per cent. In 1994, there were 40 million cases of pertussis and 306,000 deaths worldwide. Three doses of pertussis vaccine are supposed to be given within the first six months of life, but in the developing countries immunisations are often delayed and there are high drop out rates between the first and the third doses. In Kenya, only 40%, of the children had received the third dose of diphtheria/pertussis/tetanus (DPT III) by their first birthday in 1995(5).

Polio whose transmission rate is higher in areas of poor sanitation affects one in 200 infants less than one year old and 1 in 100 among children aged 0-4 years, leaving them at risk of paralysis. Polio vaccine is routinely given four times at birth, six weeks, ten weeks and at fourteen weeks. Other vaccines can be given during National Immunisation Days (NIDs). Kenya had a rate of

one in 100,000 acute flaccid paralysis (AFP) cases in children under 15 years in 1994. Oral Polio Virus III (OPVIII) coverage was only 33% in 1995(5).

This study was carried out in Mathare Valley because it is a slum in a developing country that is struggling to achieve the WHO set target for immunisation coverage. This area is unique in its characteristics; the inhabitants of this slum are among those with a socio-economic status that is the lowest in the society with poor environmental sanitation and limited access to health care.

This study was therefore carried out with the objective of identifying factors that determine immunisation coverage of children under five years in this area. This would enable health providers devise programmes that target these factors so as to increase immunisation coverage among the inhabitants of Mathare Valley.

MATERIALS AND METHODS

The study was carried in Mathare Valley, a sprawling slum in Starehe Division of Nairobi City. It lies between 0°25' and 1°20' South of equator, 36° 31' and 37 °15' East. It has an altitude of 3860 metres above sea level and is one kilometre from the city centre.

The population is approximately 50,000 with a population density of 500 people per km^2, a housing density of 250 units per hectare and about 10,000 households with an average of five members. The land tenure system is mainly on freehold basis where the landlords have title deeds for the piece of land but do not stay in Mathare. The area is roughly divided into ten villages/ units. The average infant mortality rate is 41.1 deaths per 1000 live births, sex ratio (male to female) is 1.2:1 and the average life expectancy at birth is 58 years(4).

This was a cross sectional study carried out over a two-month period (November to December 1999). The study population was mothers with children under five years of age who had resided in Mathare Valley for a period not less than five years prior to the study. A 95% confidence interval was used assuming 50% coverage since this is not known in the study area. A sample size of 360 mothers was obtained using WHO-modified-EPI cluster sampling procedure.

Data collection tools: A structured questionnaire was used to collect quantitative data such as demographic, knowledge, attitude and practice of the study group. Interviewer/respondent session was used, where the interviewer asks the question and records the response in the questionnaire. The questions were close ended.

The BCG scar, permanently left on the upper third of the lower arm of under five year old children was checked to ascertain that the vaccine was given. This helped gauge the validity of the information given by the respondent.

Child health charts of the individual children used in MCH/ FP clinics were scrutinised to help in the assessment of the immunisation status of the child.

Methods of data analysis and presentation: The data were entered into a computer and analysed using SPSS software. Measures of central tendency were used, for example, mean, mode and median to describe data of one variable at a time. Measures of variability like range were also used.

Ethical considerations: Consent to execute the study was obtained from the Research and Ethics Committee. Faculty of Health Sciences, Moi University and from the provincial administration. Informed and written consent was sought and obtained from all the respondents before administering the questionnaire after explaining the nature and aim of the study. Assurance was given that all the information was to be treated confidentially and that information obtained was to be used for their own benefit. The study was not experimental and did not cause harm to the respondents. Where necessary, respondents received appropriate advice on immunisation and its importance.

RESULTS

A total of 360 respondents in 304 households were interviewed with a total number of 532 children. Forty three interviewees declined to participate in the study while three became uncooperative during the interview and thus the exercise had to be called off prematurely.

The mean age of the respondents was 24 years and mean duration of stay in Mathare Valley was six years. The majority, 297 (82.5%) were married and 254 (70.6%) had primary school education and above. Only 27 (7.5%) were employed with over a half of the families interviewed surviving on a family income of between Kenya Shillings 1000-2000. The majority, 306 (85%) walked to immunising centres which were within 4 km of their homes. Those who had missed scheduled vaccines at least once were 62 (17.2%) which made 12 (3.3%) of them drop out.

(a) Knowledge: The majority, 324 (90%) of the respondents could define immunisation and 166 (46.1%) could mention all the six-vaccine-preventable diseases. Most of the respondents, 276 (76.6%), got information on immunisation from health centres. The most mentioned disease was polio, 270 (75.%) and the least mentioned was diphtheria, 41 (11.3%). Two hundred and seventy (75%) indicated that it was not right for a child to be vaccinated while sick. Fifty six (15.6%) scored more than average in the knowledge score.

Figure 1 depicts the knowledge score of the respondents. The knowledge scoring system was based on a set of ten questions gauging respondent's knowledge of immunisation information. The score was then rated on a scale of ten: Good 6-10, Average 5 and poor 0-4.

Figure 1

Knowledge score

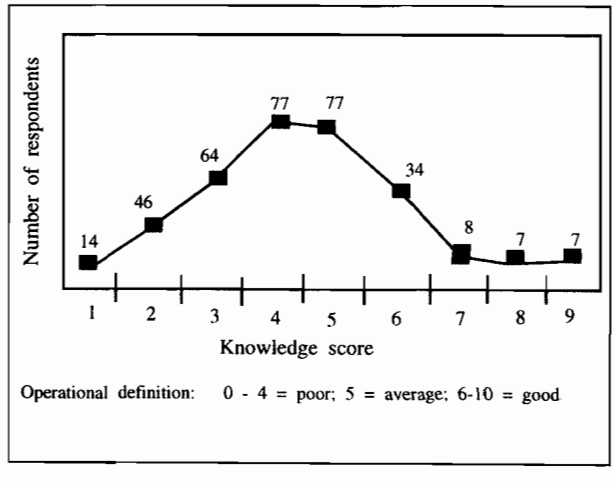
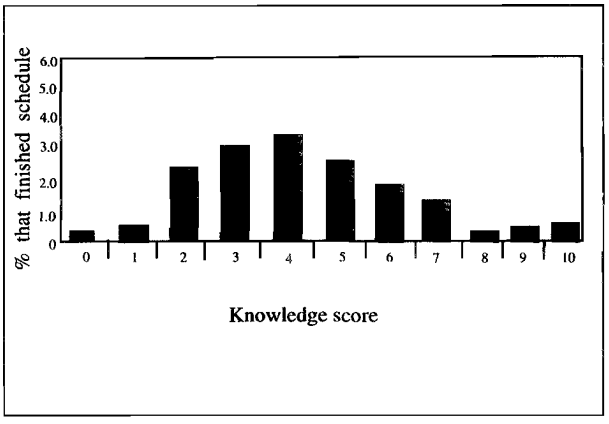


Figure 2

Relationship between knowledge score and immunisation coverage

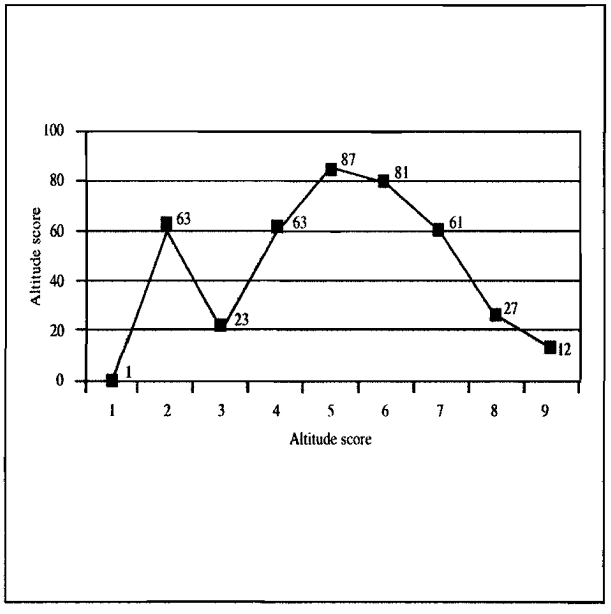


Knowledge on immunisation significantly influenced whether a child was immunised (p=0.001). This is shown in Figure 2.

(b) Practice: Three hundred and thirty one children (62.2%) were fully immunised, 155 (29.1%) were partially immunised and 46 (8.6%) were not immunised at all. The reasons given for dropping out of the schedule included: negligence 147 (40.8%), cost 90 (25%) and being "busy" 59 (16.3%). Immunisation information for 112 (21%) of the children could not be established as their parents had left health cards up-country, misplaced or lost them. If the mother was not able to provide a card for the child at all she was asked a series of probing questions whether or not the child had received BCG, Polio, DPT (including the number of doses for each), and measles vaccines.

Figure 3

Line graph showing the attitude score as scored by the respondents

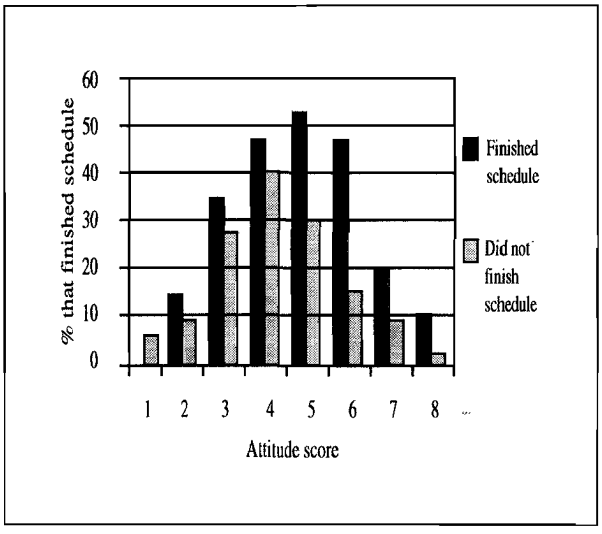


(c) Attitude: The majority, 268 (74.4%) scored, more than average on the attitude scale, that is, their attitude was positive as shown in Figure 3. The scoring system was based on a set of ten questions which were used to gauge the respondent's attitude to immunisation. The score was then rated on a scale of ten [10]; Positive 6-10, Neutral [5], Negative [0-4].

The attitude of the mother towards immunisation did not influence whether her children finished immunisation schedule or not as this was not statistically significant (p=075) (Figure 4).

Figure 4

Attitude score and immunisation coverage



(d) Age: It was evident that the age of the mother influenced the immunisation status of her children. Younger mothers had more of their children immunised than older mothers (p=0.046) (Figure 5). Knowledge on immunisation was inversely proportional to age (p=0.032) (Table 1).

Table 1

Relationship between age and knowledge score

Age (yrs)	Knowledge score			
	Poor 0-4	Average 5	Good 6 - 10	Total
15 - 19	18 (13.8)	29 (21.8)	86 (64.4)	133 (100)
20 - 24	19 (25)	36 (47.5)	21 (27.5)	76 (100)
25 - 29	14 (26.6)	25 (46.1)	15 (27.3)	54 (100)
30 - 34	18 (42.2)	16 (36.3)	9 (21.5)	43 (100)
35 - 39	19 (58.3)	7 (23)	6 (18.7)	32 (100)
40 - 44	14 (65)	6 (25)	2 (10)	22 (100)
Total (n)	102	119	139	360

Figures in brackets are percentages.
Knowledge on immunisation was inversely proportional to age of the mother (Spearman Rank test p=0.03).

(e) Level of education of the respondent had an impact on the immunisation status of her children (p=0.023) (Figure 6).

Figure 5

Relationship between mothers age and immunisation coverage

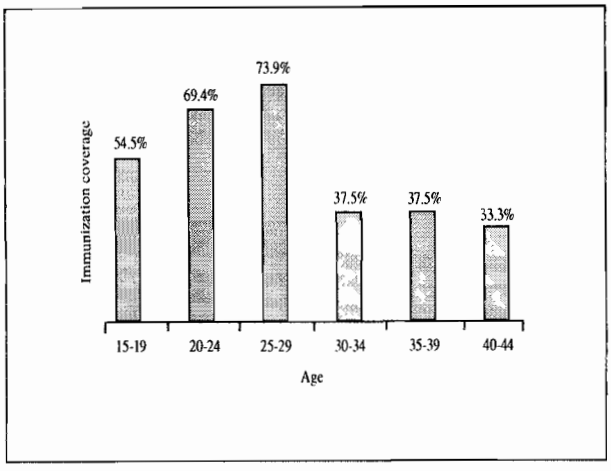
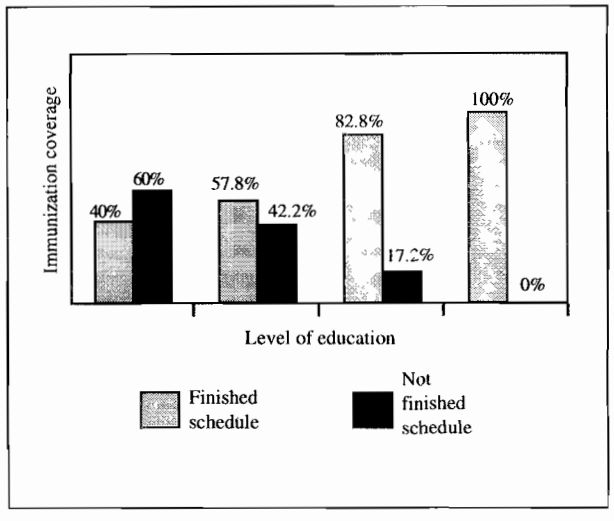


Figure 6

Relationship between level of education and immunisation status



(f) Marital status: There was a weak correlation between marital status and whether a child was immunised (p=0.063). More married mothers had their children complete immunisation schedule than the other groups (Table 2).

Table 2

Marital status and immunisation coverage

Marital status	Finished schedule	Not finished schedule	Total
Married	186 (62.6)	111 (37.4)	297 (100)
Divorced	7 (38.9)	11 (61.1)	18 (100)
Widow	10 (66.7)	5 (33.3)	15 (100)
Single	18 (60)	12 (40)	30 (100)

Figures in brackets are percentages

Married mothers had more of the children immunised than single mothers but there was no statistical difference (Fischers test p=0.06)

(g) The family income had no impact on the immunisation status of the children in the family (p=0.960). The same was true for the distance travelled to immunising center (p=0.798). The number of children in the family also did not have any significant effect on their immunisation status (p=0.468).

(h) Source of information on immunisation did not influence whether a child was immunised (p=0.234). This was also true for the mother's occupation (p=0.619). Factors a, d, e and f were significantly associated with child's immunisation status p<0.05 while factors, c, g, h, had no significant association with the child's immunisation status

DISCUSSION

Most of the mothers could define immunisation and this is probably due to the fact that 93.1% were literate and therefore had come across immunisation in school. 75.6% could identify polio as one of the vaccine-preventable-diseases. This can be explained by the recent "kick polio out of Kenya campaign" which indicates that health education and promotion can be used to increase awareness and consequently coverage. This is in line with the results from a study by Sullivan *et al*(5), which associated literacy with high levels of up-to-date immunisation.

More than sixty one per cent could name measles and 28.2% TB probably due to their prevalence and severity. However, 75% believed it was wrong to vaccinate the child while sick. This is of concern since it could mean that the child would not get the vaccine on the scheduled date. Schulter and Ford found that those infants who were late for any immunisation were likely to be late for subsequent visits and be incompletely vaccinated by the age of two years compared to those infants who presented on time(6). Young mothers (<30 years) showed a positive attitude probably because of a higher level of education.

Immunisation coverage in Mathare Valley was found to be lower than the national coverage. Those who dropped out or never began the schedule at all (32.8%) gave various reasons. The most common was ignorance (40.7%). Kimmel found the same problem in a study in the US. He indicates that parents must be educated about the importance of vaccines and the hazards of the diseases they prevent. They must also be given proper information about vaccine side effects and contraindications(7).

Parental lack of knowledge for the need for vaccines was the most identified reason by parents (58%) for their children's missing vaccine(s) according to a study by Bradford(8). Although many were still within the recommended age range for receiving needed immunisations, a large number of these parents stated that they did not know further vaccines were needed(8).

Knowledge on immunisation was significantly associated with age. Eighty five per cent of those who scored 60-100% in the knowledge score were less than 30 years of age, the majority (63.7%) of whom were in the 20-24 years age group as opposed to only 10% in 35-44 years age

group. The difference can be explained by the fact that, the younger mothers are more educated and hence their knowledge on immunisation was consequently more than the older mothers. The same findings were realised by Bjerragaard *et al*(9) and Brown *et al*(10) who found that the parent's lack of information on childhood diseases contributed to the low immunisation status of their children.

The level of education of the mother was significantly associated with immunisation coverage. Of those who had no formal education, only 40% had their children fully immunised compared to 57.8% of those with primary school education, 82.8% for those with secondary education and 100% for those with tertiary education. This result is expected since more years of schooling means more rounded knowledge that includes immunisation and its advantages.

No relationship was established between family income and immunisation coverage. This is unlike a study by Bjerregaard *et al*(9) who found socio-economic status a factor determining immunisation coverage. The same findings were obtained by Marks *et al*(11) in a study "Risk factors associated with failure to receive vaccinations" in which they found a significant relationship between socio-economic status and immunisation coverage. The study showed that the completion rate for the basic immunisation increased with increase in family income. The difference can be attributed to the fact that these studies were nation-wide thus bringing in the aspect of income as opposed to ours which concentrated on one geographical region with more or less the same income level.

The distance a mother travels had no significant impact on immunisation uptake. Bjerregaard *et al*(9) also failed to identify any significant relationship between immunisation status and the distance clients had to travel to the health facility. Others like Dick and Heggenhogen (unpublished data) report that one of the contributing factors to low immunisation acceptance in the developing countries was the distance from the health services. Maalim found the same results (personal communication). The difference can be explained by the fact that 85% of the mothers travelled only one to four kilometres to the clinic and 91.6% walked there unlike in other studies where a mother had to walk the better part of the day to reach a health facility(9).

No significant difference was established between the immunisation status of children in families with more siblings than with less siblings. There was however a trend of better immunisation coverage in smaller families, that is, 65.5% of those families with one to three children were fully immunised compared to 60.6% of those with four to six children and 54.1% for those with more than six children. This can be attributed to the fact that, smaller families belonged to the younger mothers who are more educated and have better attitude towards immunisation than the older mothers. The same results were obtained from a study by Mark(11) which revealed that, the completion rate for the basic immunisation was inversely related with family size i.e. lower rates of vaccination were seen in the larger families.

No relationship was found between the source of information on immunisation and the immunisation coverage. However, the highest immunisation coverage was found in school category (School as the source of information) due to the fact that those in this category were mainly the younger mothers who were more literate.

There was no association between the mother's occupation and the immunisation coverage. More than fifty seven per cent of those self-employed had their children fully immunised compared to 64.6% of the unemployed and 70.4% of the employed. Bjerregaard *et al*(9) associated the mother's occupation and the level of immunisation for her children. The difference could have been due to the fact that theirs was a nation-wide study unlike ours which concentrated on one region where residents are more or less of the same economic status.

In conclusion, immunisation coverage in Mathare Valley was lower than the national level (65% for children up to 23 months). This could be associated with age, marital status, level of education, level of knowledge and attitude towards immunisation. Measures should be put in place to improve the immunisation coverage through involvement of all stakeholders using appropriate community based campaigns.

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