ORIGINAL ARTICLE

DO WE NEED TO GIVE MEASLES VACCINE TO CHILDREN EARLIER THAN THE CURRENTLY RECOMMENDED AGE?

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Background: Measles is a leading cause of death among children. No specific drug has yet been discovered to treat measles but an available vaccine can effectively prevent the infection. In Pakistan children are vaccinated against measles by two doses given at age of nine months onward. The last few years have witnessed an increasing number of measles cases at age lower than nine months. **Methods:** Secondary data analysis of the records of Expanded Program on Immunization from all districts of Sindh was performed from January–April 2016. Data included all patients of any age or gender, fulfilling the World Health Organization case definition of measles, along with positive IgM antibodies for measles in their blood. Data was analysed using windows SPSS version 21.0. **Results:** Analysis of 658 confirmed measles cases showed an age range of 3 months to 336 months with a mean of 32.82. Most patients (41.4%) belonged to age group 10-24months. Some noteworthy18% of cases were ≤9 months old including 1.8% patients who were ≤6 months age. An unexpected 76 (11.6%) were >60 months of age. 50.6% of the cases were male while 49.4% were female. Most of the patients (73.9%) belonged to urban areas. **Conclusion:** We conclude that a sizeable number of children are infected by measles before reaching the age of first recommended inoculation against measles. It is affecting people at both extremes of life ranging from as young as three months up to 28 years of age.

Keywords: Measles; Vaccination; Child; Immunity; Infant; Infection

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INTRODUCTION

Measles is a highly contagious disease known that used to be once an inevitable experience of childhood with infectivity rate of almost 100%.[1,2] In some areas of the world, measles remain a serious threat to children[1] since it is one of the commonest causes of mortality among children in spite of the availability of an effective vaccine.[3] According to a World Health Organization (WHO) estimate 30 million people are infected by measles annually and results in 454,000 deaths all over the world. Two third of these deaths occur in developing countries including Pakistan.[4] The case fatality rate of measles may increase to 10% in areas having a high prevalence of malnutrition and inadequate health facilities.[3] In the absence of any specific treatment for measles we are left with no option but to prevent the disease by vaccinating our children against measles thus making vaccination a vitally important deed. Once worldwide in distribution, endemic transmission of measles has been interrupted in many countries owing to widespread vaccine coverage with consequent scarcity of measles and 79% drop in measles deaths between 2000 and 2014.[1,3,5] In contrast, Pakistan stood out with the highest incidence of measles in the Eastern Mediterranean region in 2013 with 100% increase in incidence from the previous year.[6] WHO and UNICEF in their strategic "Global Plan for Measles Mortality Reduction, 2006–2010" targeting 47 priority countries with high measles burden have recommended the first dose of measles vaccine to all on reaching the age of nine months or just after and to ensure the second dose within the recommended time.[7] In Pakistan measles vaccine used to be given in a single dose at nine months, but later a booster dose at 15 months was introduced in Expanded Program on Immunization (EPI) in 2009.[8] Similar schedule is recommended by the Integrated Management of neonatal and childhood Illnesses (IMNCI) too except that the second dose of measles vaccine may be given at any suitable moment with a minimum gap of one month after the first dose.[9] It is the balance between the ages of vulnerability to an infection and the defence provided by the maternal antibodies that decides the age for vaccination in a child.[10] The maternal antibodies against measles protect a child against the disease for 6–15 months after birth. Presence of these antibodies hampers the immunogenicity of the vaccine. During an epidemic of measles, the vaccine is sometimes given to children as young as six months of age since in many developing countries, infection occurred at a much lower age.[2,4,11] It was observed during the last few years that an increasing number of patients were getting infected with measles at age lower than nine months, which is the recommended age for first dose of measles vaccine. Some patients were even less than six months old.

We decided to carry out this study in order determine the frequency of patients presenting with measles before the currently recommended age of measles vaccination in the province of Sindh. Proving that a noteworthy number of children are getting infected with measles before reaching the age of first inoculation against measles, we will move to shift the age of measles immunization to six months instead of nine and thus prevent a lot of morbidity and mortality associated with the disease.

MATERIAL AND METHODS

This is a secondary data analysis of the records of EPI from all districts of the province of Sindh from January–April 2016. Data included all patients of any age or gender, fulfilling the WHO case definition of measles, who were reported to or picked by the measles surveillance officer. Cases were selected through simple random sampling having positive IgM antibodies for measles in their blood specimen tested at the National Measles Laboratory, NIH Islamabad. Measles case was defined by WHO as: "Any person with generalized maculo-papular rash and fever plus one of the following: cough or coryza (runny nose) or conjunctivitis (red eyes)" or "Any person in whom a clinician suspects measles".

Patients recruited as suspected measles but were negative for IgM antibodies for measles were excluded. Patients where data (age/ EPID no) was missing were also excluded. Estimated sample size was calculated by presuming average measles prevalence of 71%, with margin of error of 3.5%, on 95% confidence interval.

Patients satisfying case definition of measles by WHO were enrolled and 3–5 ml of blood specimen was collected from all subjects for IgM test using a sterile syringe during 4^{th}–28^{th} days of rash onset. The specimen was labelled and sent to Executive District Officer (EDO) Health office and then transported to National Measles Laboratory, NIH Islamabad in reverse cold chain (2–8 °C) after separation of serum from the whole blood on the day of collection. A Surveillance Report for Health Facility also accompanied the blood samples and an Epidemiological identification number (EPID number) was assigned to all suspected cases. Patients with a positive report of serum IgM antibodies against measles were confirmed as measles cases. The recording of this information is part of the Measles Case-Based Surveillance and Outbreak Investigation EPI. Data was analysed using windows SPSS version 21.0 for frequency of patients equal to and under the age of 9 months. Frequency of a sub group under six months was also calculated. Results were described in frequencies and percentages.

RESULTS

EPI Record of 1033 cases reported as measles was analysed and 658 (63.7%) of these were found to be positive for IgM antibodies against measles thus confirmed as measles cases. Age ranged from 3 months to 336 months with a mean age of 32.82. The most common age group affected by measles was 10–24 months accounting for 249 (41.4%) of cases. A noteworthy number {120(18%)} of confirmed cases of measles were ≤9 months old. (Table-1) This also included 12 (1.8%) patients who were ≤6 months old.

An unexpected 76 (11.6%) were >60 months of age. Most (73.9%) patients belonged to urban areas. Analysis of the cases showed 333 (50.6%) male and 325 (49.4%) female patients. (Figure-1).

Table-1: Detailed categorization of age and geographical distribution of measles

Age (Months)	n	%
≤ 6 Months	12	1.8
7–8 Months	74	11.2
9 Months	34	5.2
10–12 Months	86	13.1
13–24 Months	163	24.8
25–36 Months	109	16.6
37–48 Months	58	8.8
49–60 Months	46	7.0
>60 Months	76	11.6
Area		
Rural Area	172	26.1
Urban Area	486	73.9

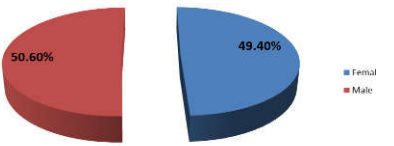

Figure-1: Percentage distribution of gender (n=658)

DISCUSSION

United Nation's Millennium Development Goal 4 (MDG4) aimed to reduce measles-related deaths and improving measles vaccination coverage globally between 1990 and 2015.[12,13] The timing of routine doses and the want for supplemental immunization activities (SIAs) influence the selection of an ideal vaccination strategy. The WHO in 2004 started the analysis of national immunization and surveillance data along with their vaccination strategies with the

intention of making alterations in vaccination program strategies such as moving the scheduled age and improving coverage for routine vaccination, adjusting the frequency, age range, or coverage of supplementary immunization activities (SIAs) adding a second routine dose etc.[14] Thus the age and the vaccination status of the affected person becomes two significant variables that need active surveillance. The age variable in our study subjects showed a sizeable number of confirmed measles cases (18.2%) who were equal to or below the age of 9 months which is the standard scheduled age for first dose of measles immunization in our country. This also included 12 (1.8%) patients who were ≤6 months old. Our results are corroborated by Rahim and co from Peshawar who documented 6–9 months age as the most frequently affected by measles accounting for 42 out of 129 (32.55%) of all measles cases.[4] Similar results of measles infection in infants and children before reaching the age for first dose of immunization against measles has been documented from all over the world including Malaysia[15], various districts of Mozambique[16], Nigeria[17] and United States[18,19] with reported frequencies of 25–35%, 11–22%, 31.19% and 24% respectively. In addition, Ontario[19] and North-East region of England[20] also reported highest incidence among infants before the age of measles inoculation in their countries. This fact of measles infection occurring at a younger age is further evidenced by a decision of giving an extra dose of vaccine to infants 6–11 months old before traveling abroad and for infants 6 months of age who are known to be exposed to measles or at high risk of exposure in outbreak settings.[4,19,21] This acquisition of measles infection at an earlier age in developing countries raises the question if the vaccine is being administrated at the right age. Although it has been linked to suboptimal immunity due to poor nutrition and a rapid loss of placentally transferred antibodies in these countries,[4] researchers have also documented that maternal antibodies protect their offspring from measles for the initial 2.61 months only after birth, leaving a gap of about six and a half months before he gets his first dose of vaccination during which he is fully susceptible.[10] This may possibly explain an increasing frequency of measles in younger infants.

According to the WHO the measles surveillance system should be a dynamic process whereby health-related data is collected and analysed to use for re-designing effective disease control interventions. An example of such intervention is the introduction of extra doses of vaccine in various countries for children entering school after the documentation of high incidence of measles in older children by the measles surveillance system.[16] It has similarly been recommended for adults too.[22] In our study too we documented an unexpected 11.6% (76) of the cases who were >60 months of age including adults too which is contrary to popular belief that measles is a disease of young children only. Measles in adults has also been reported from around the globe varying in frequency from 6.45% from Nigeria[17], 14–16% from Mozambique[16] and Malaysia[15] respectively to 41% from England[20]. In the UK, Wales has also shared a case of measles in a 25-year-old that subsequently died because of pneumonia.[18] Similarly, Pennsylvania and Virginia also documented measles in adults as old as 39 years.[23] Malaysia reported maximum age of >40 years with measles[15] while the oldest patient who acquired measles in our series is 28 years old. (336 months). In our data, the age ranged from 3 months to 336 months with a mean age of 32.82. This is comparable to results from Ontario showing measles ranging between six months and 59 years suggesting that measles can happen in all extremes of age. Pursuing the WHO recommendations, these results call for a change in the vaccination policy in the province of Sindh. The national health policy makers must choose between protecting infants as early as possible when the risk of mortality is greatest by giving the first routine dose of measles at an earlier age, or delaying with consequent increase in frequency, morbidity, complications and mortality[19]. Assessment of the burden of disease by active surveillance thus remains critical to guide vaccination policy for measles eradication plan.

We did not find any significant predilection of gender for measles infection in our study where 333 (50.6%) patients were male and 325 (49.4%) were female. Review of literature showed inconsistent preponderance of gender in measles with Ontario reporting predominance of female[19] against a marginally higher percentage of males than females in Nigeria[17] and higher frequency of males (64.6%) from Peshawar[4]. This inconsistency may be an indicator of the cultural differences and local factors affecting the immunity of these patients.

CONCLUSION

We conclude that a sizeable number of children were infected by measles before reaching the age of first recommended inoculation against measles. It is affecting children as young as three-month-old. It is further concluded that measles is also affecting older population as well causing disease in as old as 28 years.

RECOMMENDATIONS

We recommend that the age for first dose of measles vaccination be shifted to six months instead of current nine months, at least in the province of Sindh

so as to prevent a lot of morbidity and mortality associated with measles. This record mostly comprises the cases which were reported to the surveillance officers thus missing the lot who were seeking medical advice from general practitioners, faith healers, quacks and even those who preferred to stay home. Therefore, we also recommend further studies to include these patients too.

The limitation of this study is that the data included is from the province of Sindh only so it cannot be generalized to all the provinces of Pakistan. Therefore, we recommend analysing the data, which is easily available with the EPI, from the whole Pakistan and redesign the vaccination policy as soon as possible. We further move the managers to analyse the data for adults also and consider booster at a later age too.

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AUTHORS' CONTRIBUTION

AJ; concept of study, literature search, data interpretation and write up. YY; data analysis & interpretation and proof reading. MTK; proof reading

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