

Causes of Measles Outbreak in Al-Sader city-Baghdad/Iraq

Mohammed shaker Al-Awady (M.B.C.H.B,F.I.C.MS)

Department of pediatric –AL-Imam Ali hospital, Baghdad-Iraq

Abstracts

Background: measles is a highly contagious viral disease causes high mortality and morbidity in pediatrics. It is a preventable disease (by vaccination). So vaccination is a major issue in preventing the disease and its spread. The study conducted in this research work aims to allocate the causes of new epidemic of measles in Al-Sader city and its prevention if a future attack may occur.

Patients and methods: A case-control study done on patients attend Al-Imam Ali hospital from 1st of march to 31st of may. Data collected from patients who diagnosed clinically as measles (318 patients) and from patients attend the same hospital for other medical problems (3280 patients).

Results: Measles diagnosed clinically in 318 patients. 73.6% of them (their ages 5 years and younger), 13.8% were vaccinated and 22.9% were from low socioeconomic class. 97.1% were in close contact with measles cases; 48.7% were admitted to the hospital. Unfortunately one baby died (age was 9 months).

Conclusion: vaccination programs should be more effective, age of first measles vaccine should be re-evaluated. While public education about vaccination and diseases control should be taught via various media channels.

Key words: measles vaccine, Infant mortality.

Introduction

Measles is a leading cause of death among young children even though a safe and cost-effective vaccine is available to prevent the disease. In 2007, there were 197000 measles deaths globally-nearly 540 deaths every day or 22 deaths every hour (mostly children under age of five). More than 95% of measles deaths occur in low-income countries with weak health infrastructure. Measles vaccination efforts have reaped major public health gains, resulting in a 74% drop measles deaths between 2000 and 2007 worldwide. Two doses of the vaccine are recommended to ensure immunity, as about 15% of vaccinated children fail to develop immunity from the 1st dose(1).

Measles is a serious highly contagious disease (90% of which who haven't been vaccinated for measles will get it if they live in the same household as an infected person(2)). Measles is caused

by a virus in the paramyxovirus family. It is a human disease not known to occur in animals. The virus remains active and contagious in the air or on infected surfaces for up to 2 hours. It can be transmitted by an infected individual from 4 days prior to the onset of rash to 4 days after the rash erupts. Unimmunized young children(who has not been vaccinated or recovered from disease) are at highest risk of measles and its complication, which might be concluded by death. Measles outbreaks can be particularly deadly in countries experiencing or recovering from a natural disaster or conflict. Damage to health infrastructure and services interrupts routine immunization, and overcrowding in residential camps greatly increases the risk of infection(1). In countries where measles has been largely eliminated, cases imported from other countries remain an important source of infection.

Infant acquire immunity

transplacentally from mothers who had measles or measles vaccination. This immunity is usually for first 4-6 month of life and disappears at variable rate. Some studies now suggest that infants of mothers with measles vaccine- induced immunity lose passive antibody at a younger age than infants of mothers who had measles infection (3).

The measles outbreak started slowly in Iraq at early weeks of 2008, picked up momentum during the summer, and then took off in late 2008/early 2009. The first cases, 5 total, were reported in week one of 2008. This was the beginning of three waves of measles that have swept the country. The first lasted until late May 2008, the second up to the end of September, and the third is still ongoing. Each lasted around 19 weeks in duration. The number of cases has more than doubled since 2008. In 2008 less than 140 cases were found each week, compared to almost 1,000 per week in the beginning of 2009 (4).

The aims of this research is to demand an urgent necessity to decrease the age of measles immunization in infancy (5), the effectiveness of vaccination programs whether reach nationwide in Iraq or not and its impact on general health(6), preconception vaccination programs and its effectiveness on child immunity, decrease or eliminate morbidity and mortality of measles disease, economic burden that M.O.H might suffer when a bad vaccination programs done (due to admission, drugs, investigations...etc.) and planning for real multimedia global health education programs.

Patients and methods

A case-control study was performed prospectively in Al-imam Ali hospital in (Al- Sader city-BA-Rasafa) for the period extended from the 1st of march

to 31st of may (2009). Data were collected from 318 patients being attended the hospital and has been diagnosed clinically as measles. 3280 patients were attended the same hospital at the same period. Those patients were regarded as a control for this research work. Those patients attended the hospital for other medical problems.

The collected data include: age, sex, baby vaccination history, mother immune status regarding measles whether infected or vaccinated, contact with infected cases, hospital admission and outcome.

Results

Table no.1A show that seventy nine patients (24.8%) diagnosed as measles in which their ages are one year or less, Twelve of them (15.2%) were vaccinated with single dose of measles vaccine and the remaining 67 patient (84.8%) were not vaccinated at all. In preschool age 155 patient(48.8%) were diagnosed as measles, only 22 of them (14.2%) were vaccinated with measles vaccine (86.3% of them received single dose of measles vaccine and only 13.7% were fully immunized (confirmed by their parents)). In school age 42 patient (13.2%) were diagnosed with measles, only eight patient (19%) were immunized (75% of them were subjected to one dose only of measles vaccine). Forty two adolescence (13.2%) were diagnosed as measles and only 4.7% of them were vaccinated with measles vaccine and the remaining 95.3% were free of vaccination (unvaccinated individual).

Figure no.1 shows that 24.1% of infants with measles their ages ≤ 6 months and 75.9% were their ages more than 6 months to 1 year.

Table 1A: Patients vaccination with age of (infected patients)

Age (year)	Vaccinated		Dose (1)		Dose (2)		Unvaccinated		Total	
	(no.)	%	No.	%	No.	%	(no.)	%	No.	%
≤ 1 (Infants)	12	15.2	12	100	0	0	67	84.8	79	24.8
>1-5 (Preschool)	22	14.2	19	86.3	3	13.7	133	85.8	155	48.8
>5-10 (School)	8	19	6	75	2	25	34	81	42	13.2
>10-15 (adolescent)	2	4.7	0	0	2	100	40	95.3	42	13.2
Total	44	13.8	37	84	7	16	274	86.2	318	

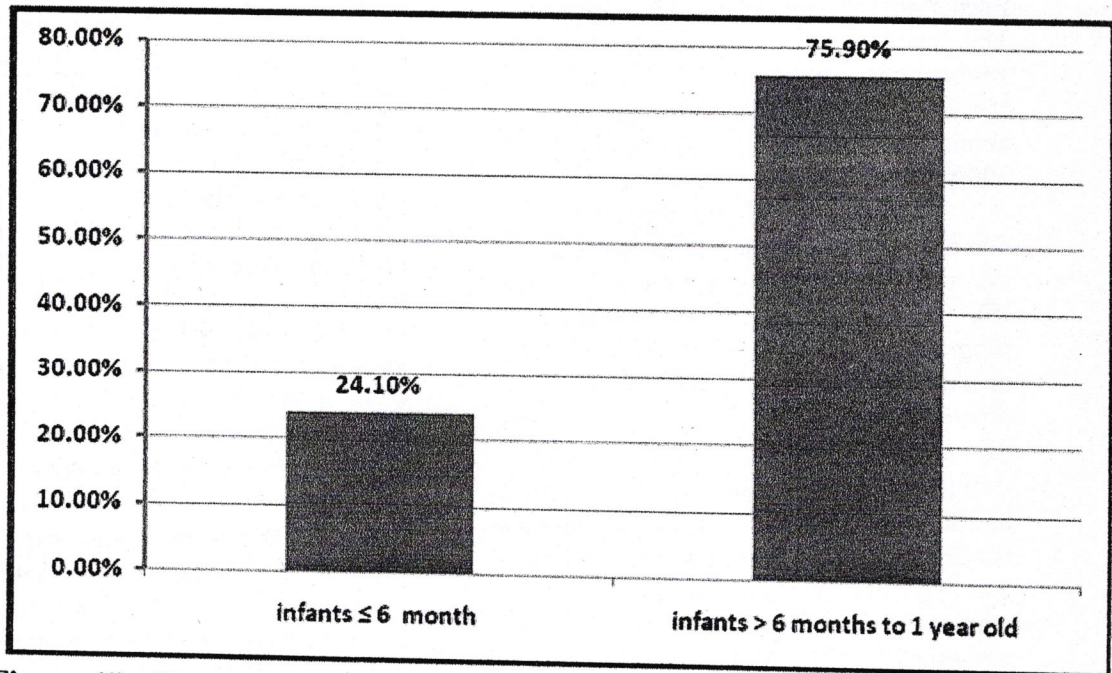


Figure (1): Shows percentages of infants ≤ 6 month and infants > 6 month to 1 year old

Table no. 1B show control patient (those attend hospital for other medical problems) where 512 patient their ages were one year or less, Seventy six of them (14.8) were immunized with measles vaccine and the remaining 436 of them (85.2%) were not vaccinated at all. One thousand seven hundred and thirty five preschool child were attend hospital, two hundred forty five (14.1%) patient were

vaccinated with measles vaccine and only 17.5% of them were fully immunized. Eight hundred and twenty five school age kids were attend hospital, one hundred thirteen patient (13.7%) were vaccinated with measles vaccine and 68.2% were fully immunized. 17.3 % of the adolescent who attend the hospital where immunized and 86.1% of them where fully immunized.

Table no.1B: Patients vaccination with age for (control patients)

Age (year)	Vaccinated		Dose (1)		Dose (2)		Unvaccinated		Total	
	(no.)	%	No.	%	No.	%	(no.)	%	No.	%
≤ 1 (Infants)	76	14.8	76	100	0	0	436	85.2	512	15.6
>1-5 (Preschool)	245	14.1	202	82.5	43	17.5	1490	85.9	1735	52.9
>5-10 (School)	113	13.7	36	31.8	77	68.2	712	86.3	825	25.1
>10-15 (adolescent)	36	17.3	5	13.9	31	6.1	172	82.7	208	6.4
Total	470	14.4	319	67.8	151	32.2	2810	85.6	3280	

Figure no.2 show that 13.8% of patients with measles where vaccinated and 86.2% where not vaccinated.

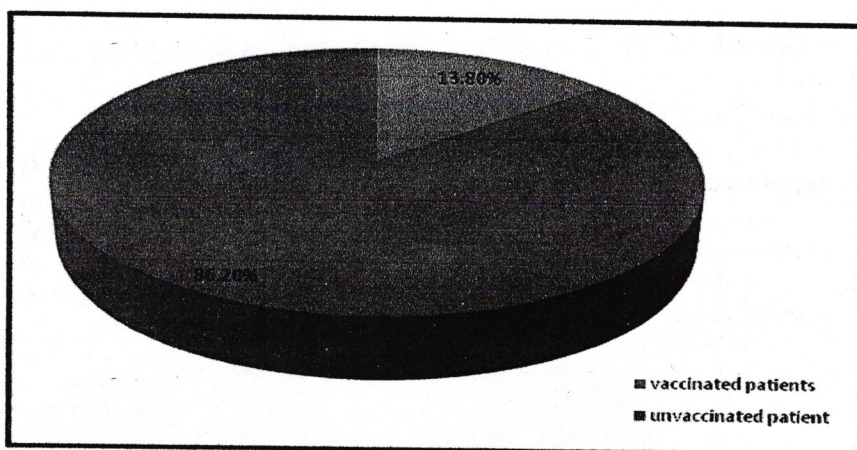


Figure (2): Relative distribution of vaccinated patient with measles

Figure no.3 shows that 8.9% of total patients attended Al-Imam Ali hospital where diagnosed with measles.

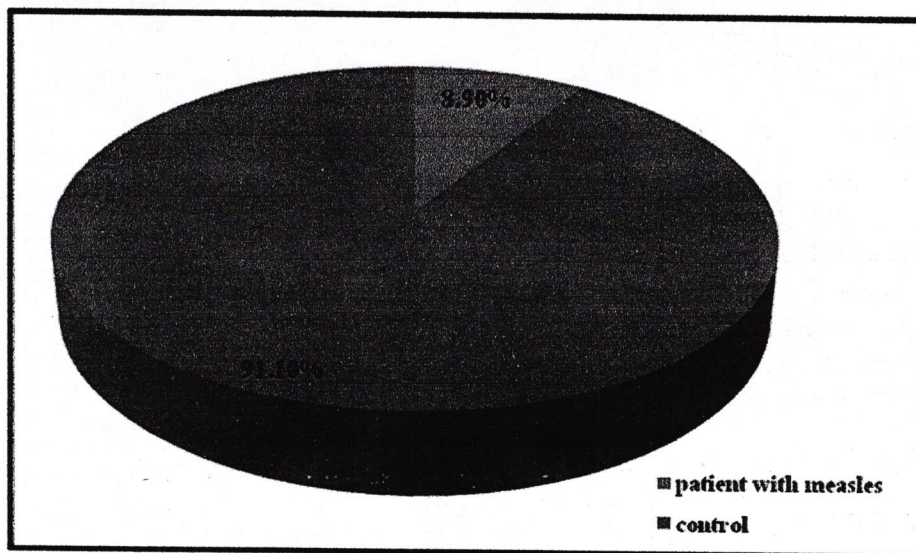


Figure (3): Relative distribution of patient with measles in total no. of patient.

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Figure no. 4 show that 41.7% of measles' patients were female and 58.3% of measles' patients were male.

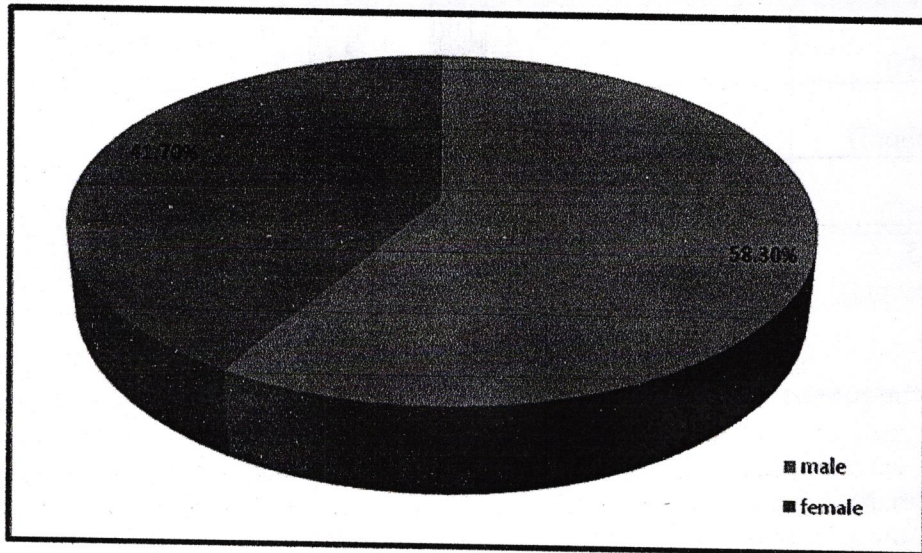


Figure (4): Relative distribution of measles according to sex

Figure no. 5 where show that 14.3% of the patients who attend Al-Imam Ali hospital were vaccinated and 85.7% unvaccinated.

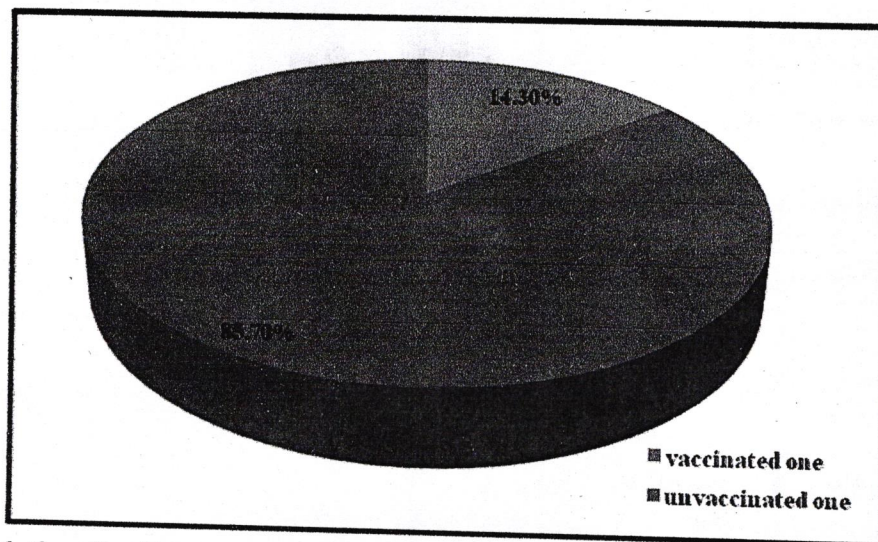


Figure (5): Relative distribution of vaccination among patient and control

Table no. (2A) show that 46.8% of mother's baby 1 year of age and less where unvaccinated, 8.9% where infected with measles in the past, 16.4% were vaccinated and 27.9% of mother's infant don't know whether vaccinated, infected or not.

Table 2A: Mother history regarding measles vaccination or infection in patient with measles

Age (Year)	Infected mother		Vaccinated mother		Unknown		Unvaccinated mother		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
≤1	7	8.9	13	16.4	22	27.9	37	46.8	79	24.8
>1	16	6.7	15	6.3	58	24.2	150	62.8	239	75.2
Total	23	7.2	28	8.8	80	25.1	187	55.9	318	

Table no.(2B) show that 67.4% (345) of the mother's infants were not vaccinated and only 8.8% (45) were vaccinated; 2.4% (12) were infected with measles in past and 21.4 (110) were not oriented whether vaccinated or not, 61.4%

of mother's child older than one year were unvaccinated and only 8.9% (249) were vaccinated; 3.6% (98) were infected and 26.1% (720) with unknown history whether they were infected or vaccinated.

Table 2b: Mother history regarding measles vaccination or infection in the control sample

Age (Year)	Infected mother		Vaccinated mother		Unknown		Unvaccinated mother		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
≤1	12	2.4	45	8.8	110	21.4	345	67.4	512	15.6
>1	98	3.6	249	8.9	720	26.1	1701	61.4	2768	84.4
Total	110	3.4	294	8.9	830	25.4	2046	62.3	3280	

Figure no.6 shows bar chart illustrate that 7 mothers (8.9%) of 1 year and less infant were infected with measles, 13 mothers (16.4%) were vaccinated, 22 mothers (27.9%) with doubtful history regarding vaccination, 37 mothers (46.8%) were unvaccinated.

Sixteen mothers (6.7%) of more than 1 year old baby were infected, 15 mothers (6.3%) were vaccinated, 58 mothers (24.2%) were unknown whether infected or vaccinated and 150 mothers (62.8%) were unvaccinated.

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Figure no.7 show bar chart illustrate that 64.6% of mothers for infants one year old and less (how attend the hospital) were not vaccinated; only 9.8% of mothers were vaccinated; 22.4% of mothers were not oriented whether they were vaccinated or not and 3.2% were infected in past with measles. This bar also

show 61.5% of mothers for children older than one year (how attend the hospital) were not vaccinated; 8.9% of mother were vaccinated; 3.8% were infected in past with measles and 25.8% of the mothers were not know whether they vaccinated or not.

Table no.(3) show that 97.1% of the patients with measles had a contact with measles cases before they got the infection.

Table (3):Patients with history of measles contact

Total no. of patient	Positive history		No history	
	No.	%	No.	%
318	309	97.1	9	2.9

Figure no.(8) shows that 245 (77.1%) of measles patients with unemployed parent while 73 (22.9%) where employed parents.

Table no.(4) show that 155 patient(48.7%) from total measles patients were admitted to the hospital for measles complication, thirty one patient (20%) where their age one year and less, seventy two patients(46.4%) where admitted to hospital their age more than one year to five years, 19 patients(12.3%) in the school age and 33 patients (21.3%) where adolescent. One patient was die; his age nine months because of measles complications (pneumonia).

Table (4): Total no. of patient admitted to hospital with their complication and outcome

Age Year	Admission		Discharged well		Referred cases		Death No.
	No.	%	No.	%	No.	%	
≤ 1 (Infancy)	31	20	25	17.5	5	35.7	1
>1-5 (Preschool age)	72	46.4	65	46.5	7	50	0
>5-10 (School age)	19	12.3	19	13.6	0		0
>10-15 (adolescence)	33	21.3	30	21.4	2	14.3	0
Total	155	48.7	140		14		1

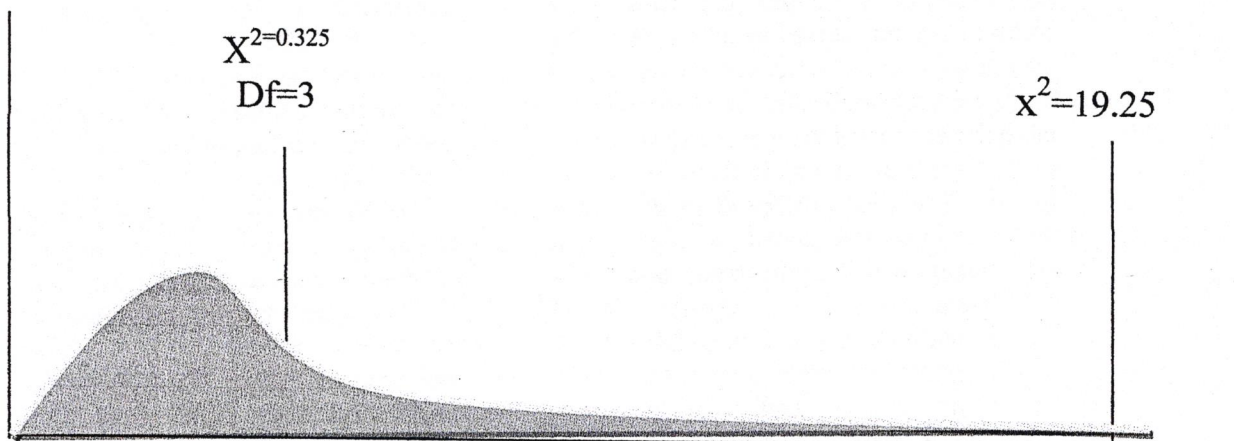
Treatment of data:

Even the data tabulated in table no. (1) column no. (2) shows that the age category (preschool >1-5 year) shows that there is high risk of infection but the

statistical treatment of data shows that with no doubt that this age category is more liable for infection even though that it have been subjected for vaccination, as the value of chi-square (χ^2) at $\alpha = 0.05$

with degree of freedom (df=3) shows that it equal to 0.352 while calculated value gives 19.25 which is far beyond critical value, on this base there is clear evidence that their is significant difference of

liability to measles infection at 1-5 years age; eliminating the null hypotheses that there were no significant difference of infection with measles versus age category.



Assumption with mode:

Ho: There is no significant difference for age category regarding measles

H1: There is clear evidence that there is significant difference for age category regarding infection with measles.

(ndf=4-1=3)

$\alpha = 0.05$

critical value $\chi^2_{\alpha, v} = 0.325$ (the value is to challenge)

Column 5 which deal with unvaccinated people , this confer the treatment for data tabulated in table (1A) column 5 confer much more strongly the evidence shown that even though the vaccinated people at age category >1-5 years shown that they are more susceptible for measles infection it again shown that unvaccinated people shown much more strong evidence that this age category is still the more susceptible age category.

Discussion

Commonest age of measles infection were those children less than 5 years old which indicate inadequate vaccination programs in the last four to five years (after war in 2003) as represented by WHO Representative's

office in Iraq (7). This decline in vaccination programs may be due to loss of security in Iraq, so vaccination campaign become ineffective(8,9).In Nigeria a study performed on measles infection regarding age, data also shows that the highest attach rate(more than 50%) were in less than 5 years old child which also due to poor vaccination programs (10). Infants with measles (their ages 1 year and younger), 24.1% of them were their ages less than 6 months which means that transplacental immunity doesn't support the baby with the needed immunity. During outbreak in Guinea-Bissau 19% of unvaccinated children had measles before 9 months of age. After early vaccination against measles 92% had measles antibodies at 9 months of age. So outbreaks of measles may be curtailed by measles vaccination as early as 4.5 months of age(11). In France a study done to see optimal age for measles vaccination, since maternal antibodies may neutralize the vaccine before specific immune response develops. While delaying vaccination may increase the risk of complicated diseases in infants. Results show that 90% of infants are not protected against measles after 6 month of age. Infant protection against measles could be optimized both by increasing herd immunity through an

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increased vaccine coverage and by lowering the age of routine vaccination(12). In developing countries where measles is highly endemic, WHO recommend that two doses of vaccine be given at six months and at nine months of age, while in developed countries, most children are immunized against measles by the age of 18 months not before because of transplacental antibodies from immunized mother and second dose given at 4-5 years to increase rate of immunity (13). In Al-Imam Ali hospital, 13.8% of patients with measles were vaccinated. 84% of them vaccinated with single dose and 16% vaccinated with 2 doses. WHO Representative's in Iraq report that 19% of measles patient were vaccinated, 66% were unvaccinated and 15% unknown vaccination status (7). In US in 1994 measles outbreak occur, 22% were reported to have documented receipt of at least one dose of measles-containing vaccine, four cases occurred among persons with documentation of two appropriately spaced doses of measles vaccine more than 14 days before onset of symptoms (14). This might due to primary vaccine failure (i.e. failure to develop antibodies after vaccination) or due to secondary vaccine failure (development of antibodies but lost shortly after vaccination)(15). In São Paulo; residential survey showed that 31.9% of cases occurred in persons who had received one or more doses of the vaccine. A high proportion of primary vaccine failures in vaccinated patients with measles can indicate, for instance, problems in vaccine technique or use of inactive vaccines due to inadequate storage. Several factors, such as age at vaccination, number of received doses, and immunogenicity of the vaccine strain, may be associated with different rates of primary and secondary vaccine failure. It is estimated that in highly vaccinated populations, 4 to 8% of measles cases in outbreaks are due to secondary vaccine failure(15). Stratified analysis showed that the number of doses of vaccine received was the most important predictor of antibody response (16).

In Al-Imam Ali hospital only 14.3% of patients attend the hospital

during this study were vaccinated; while 85.7% were unvaccinated. Therefore well managed programs is needed in order to decrease this percentage. In Viet-Nam; after a mass immunization campaign, a drop in the national incidence of confirmed measles cases per 100000 from 5.44 in 2001 to 0.14 after the campaign(17). Programs include frequent vaccination campaign, efforts to enhance access to vaccination services and health education for peoples(18).

There is no sex predilection regarding infection with measles, where 58.3% of measles patients were male and 41.7% were female, so there was no significant difference in sex regarding infection and this is confirmed by WHO Representative's Office in Iraq(7). Vaccinated mothers for children attend Al-Imam Ali hospital whose their ages one year and less were 9.8% and this mean that mothers should be vaccinated for measles before pregnancy and all adults should be if unvaccinated(19,20). Accumulation of non-immune individual led to this outbreak of measles(21). 97.1% of patients with measles were had contact with infected cases, risk of infection still high even in vaccinated individual if there were in close contact (home contact more risky than school contact)(22). 77.1% of parents of measles' patient were unemployed (poor family). Risk of infection increase in low socioeconomic class because of overcrowding(1,22), low vaccination rate and increases risk of malnourishment (1,23). 48.7% of patient with measles needed admission to the hospital mainly those how's age 5 years and younger (66.4%). In Italy commonest age for admission were those children younger than 15 years of age and children below 1 year of age presented the greatest hospitalization rates(24). In US 9% of patient with measles were hospitalized and the median duration of hospitalization was 4 days (25), 93% of hospital consultant episodes for measles required hospital admission in England 2002-03 with median duration of 2 days and mean age for admission was 5 years (26). During measles outbreak in Germany in 2006 15% of measles patients need hospitalization(21). In Italy outbreak, the

coast of measles hospitalization for 2 years combined were estimated to be equates to the coast of vaccination of 1.5-1.9 million children with one dose of measles vaccine(24). One dose of measles, mumps and rubella coast about 33 US cents per dose including the syringe(27). One patient was die due to measles complication (pneumonia) in Al-Imam Ali hospital. In developing countries, mortality rates among children with measles is 1%-5%, but in refugee situations and among malnourished children, it may reach 10%-30% (10,28). In Iraq measles consider the 3rd most common cause of death in children younger than 5 years old after lower respiratory diseases and diarrhea(29).

Conclusion

To protect all children from vaccine preventable diseases by rising parental awareness of critical need for timely infant immunization, fostering the establishment of a systemic method to locate and immunize children, providing convenient access to immunization services in future, decrease age of first measles vaccine to age of 6 months or even younger and frequent campaign to vaccinate individuals even if vaccinated before.

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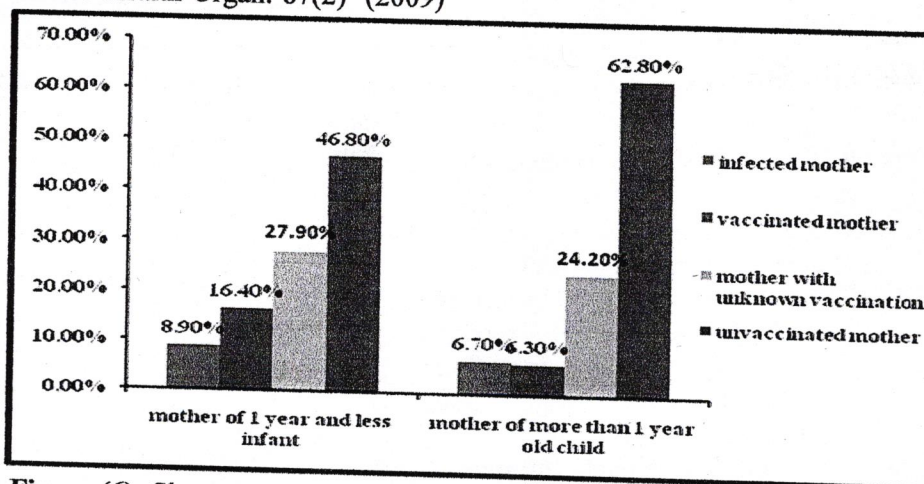


Figure (6): Shows mother's immunity regarding age for patients with measles

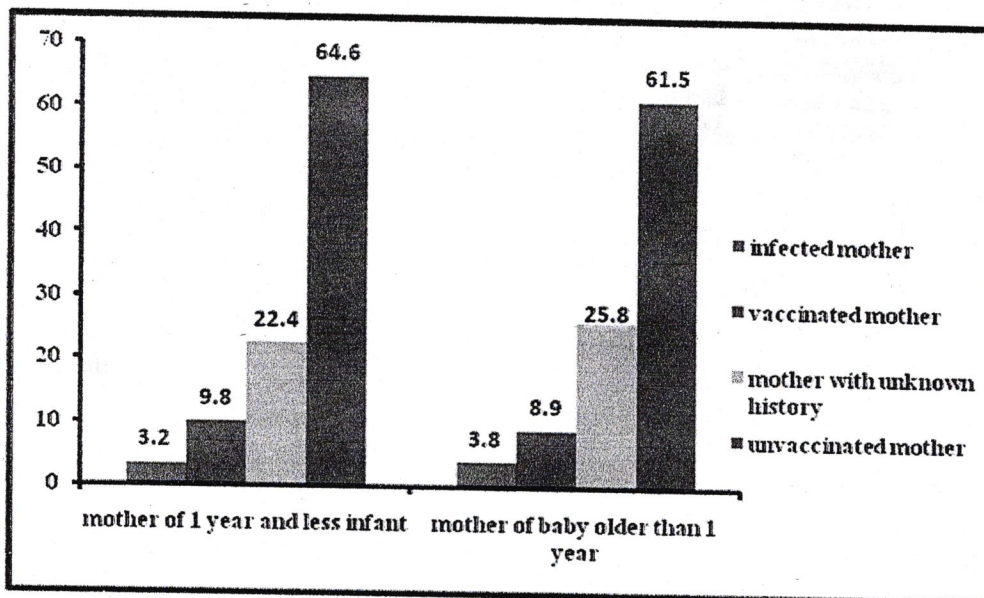


Figure (7): Bar chart show % of infected mother, vaccinated mother, those with unknown history of vaccination and unvaccinated mothers for children who attend the hospital.

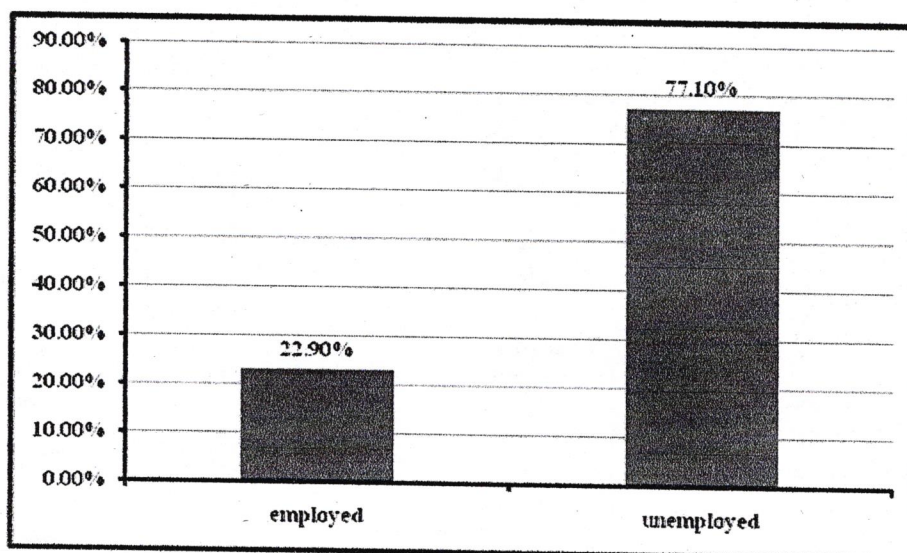


Figure (8): Bar chart show percentage of employment in patients with measles