The epidemiological criteria of measles outbreak in AL-Elwyia Pediatric Teaching Hospital at 2024

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Abstract

Background: measles is highly contagious disease and is the leading cause of childhood mortality and morbidity worldwide, despite the adoption of effective vaccine, many outbreaks occurred globally understanding the epidemiological criteria of measles are very important in order to control measles spread.

Aim of the study to assess the epidemiological criteria of measles outbreak in Al-Elwyi Pediatrics Teaching Hospital in 2024 and to find out the association between measles outbreak, vaccination statues and sociodemographic character of mother.

Subject and methods: descriptive cross-sectional study conducted in AL-Elwyia Pediatric Teaching Hospital, Baghdad, Iraq during a period of 5month from (1st February to 30th June 2024.), 265 children were chosen for the study by convenient method of sampling by interviewing with the mothers of all children whom suspected cases of measles by clinical feature and visited to Al-Elwyia Pediatrics Teaching hospital outpatient clinic. Descriptive statistics and chi-squire tests were applied to analyze the data.

Result: among 265 children with measles, this study demonstrates that the highest percent of cases belonging to under one years of age (41. 9%) regarding sex (55. 8%) of cases were female and 42.9% were unvaccinated. The most common clinical features were fever, maculopapular rash and cough where gastroenteritis and conjunctivitis are less common. The study also showing that 43.8% of children with measles have history of contact with measles cases. The study demonstrates significant relationship between vaccination rate and education level of mothers.

Conclusion: The cluster of cases in Baghdad and among families with low socioeconomic status suggests inequities in healthcare access and preventive measures. The high percentage of unknown infection sources points to gaps in public health measures for tracking and containing outbreaks. The association between maternal education and vaccination highlight the importance of addressing educational barriers to improve vaccine uptake.

.Keyword measles outbreak, childhood mortality and morbidity, measles elimination.

Introduction

Measles remains one of the leading causes of child morbidity and mortality worldwide. Although the Expanded Program on Immunization (EPI) has prevented around 80 million cases and 4.5 million deaths annually, [1] repeated outbreaks continue to occur, especially in regions with weak vaccination programs. [2]

Clinically measles is an illness characterized by all of the following: a generalized maculopapular rash lasting for ⩾3 days; a temperature of ⩾38.3°C; and at least one of cough, coryza, or conjunctivitis. [3] Disease outbreak is the occurrence of disease in excess of what would normally expect in a defined community, geographical area or season.[4]

The major risk factors for measles outbreak are gaps in immunization programme according to the WHO and UNICEF reported in 2022 approximately 25 million children missed their first dose of the measles vaccine. This global decline has led to multiple outbreaks in developing and developed countries. [5]

Iraq has experienced three major measles outbreaks, the first outbreak at 1997 during the UN sanction, the second outbreak between 2006 and 2009 during internal conflict [6, 7] and the last outbreak at 2024 following the COVID-19 pandemic. [8] The pandemic led to a disruption in childhood immunization programs, which contributed to the resurgence of measles, particularly in low-income and conflict-affected countries like Iraq, Pakistan, Afghanistan, Yemen, Syria, Sudan, and Somalia. [8]

According to the CDC, Iraq ranked third worldwide in measles cases in 2024, with over 25,000 reported cases across several provinces. [8] In Lebanon, a measles outbreak began in July 2023 due to low vaccination coverage and the influx of refugees. Most cases were in children under five and were unvaccinated. [9]

In the United States, despite measles being declared eliminated in 2000, a new outbreak occurred in 2024. This has prompted renewed efforts to boost MMR vaccination, especially in under-vaccinated communities and among international travelers. [10] In Europe, measles was officially reported in 45 of 53 countries within the WHO European Region during the first quarter of 2024. In 2023, of 2,361 reported cases, 5.4% were imported and 0.9% was linked to imported cases. However, the majority were due to local transmission. The highest infection rates were among children aged 1–4, followed by those aged 5–9. [11]

Aims of study

1. To assess the epidemiological criteria of measles outbreak in Al-Elwyi Pediatrics Teaching Hospital. In 2024
2. To find out the association between measles outbreak and sociodemographic character of mother.
3. Vaccination statues and association with disease frequency.

Subjects and Methods:

Study Design, Setting and Data collection time

This was descriptive cross-sectional study conducted in AL-Elwyia Pediatric Teaching Hospital, Baghdad, Iraq during a period of 5month from (1st February to 30th June 2024.)

Population and sampling

265 children were chosen for the study by convenient method of sampling by interviewing with the mothers of all children whom clinically (not serology) confirmed cases of measles by clinical feature and visited to Al-Elwyia Pediatrics Teaching hospital outpatient clinic.

Clinical case of measles is an illness characterized by all of the following: a generalized maculopapular rash lasting for ⩾3 days; a temperature of ⩾38.3°C; and at least 1 of cough, coryza, or conjunctivitis.[3]

Inclusion criteria:

Every child under 5years suffering from measles symptoms whose mother agreed to participate in the interview.

Exclusion criteria

No exclusion criteria except the mother who refuse to participate in the interview.

Ethical and official approval

The research proposal was fully discussed by the ethical and research committee in AL-Kindy college of medicine. An official approval from AL-Elwyia Pediatrics Teaching hospital in response to an official request from University of Baghdad (AL-Kindy college of medicine) for sample collection. The individual consent was taken verbally from each mother before starting the interview. Full explanation of the study aim was given and insuring them about the confidentiality of the collected data which wouldn't be used for any purpose other than this study.

Data collection

After thorough search and review of many previous similar studies, the questionnaire form was selected by the researches. The questionnaire was sent for five pediatricians and one family physician for reviewing.

The questionnaire was included two parts:

1-sociodemographic variable

A- Patients age was divided according to WHO classification to group-

Less than one year
1years-2years
2years-3years
3-years-4years
4years-5years
More than 5years

B- Patient going to daycare or school.

C- Mothers' information including

-Age
less than 20 years
20-29 years
30-39 years
more than 40years

- vaccination statues of mother, education level of mother (reading and writing, primary, secondary, college), crowded index (person per room) which is positive in case crowded index more than three person per room excluding infants [12] and economic statues of parent

Insufficient (less than 500000 ID)
Moderate (500000-1000000 ID)
Sufficient (more than 1000000 ID).

2-question about the course of disease include; the presenting symptom (fever, rash, cough, conjunctivitis, gastroenteritis and other), vaccination statues of the patient, history of chronic disease, history of contact with measles cases and if the patient need admission or treated as outpatient).

Statistical analysis:

The information for each item on the questionnaire was copied to code sheets, the data were input into a personal computer, and the statistical package from SPSS-27 was used to evaluate the data. Simple statistics like frequency, percents, average, standard deviation, and range displayed the data. A Chi-square test (X^2-test) was utilized to identify the significance of qualitative data percentage differences. The P-value was considered statistically significant when it was equal to or less than 0.05. [13]

Results

1- Demographic characteristics of children with measles:

In Table 1**,** the results of this study indicate that the highest percentage (41.9%) of children with measles belonging to ages (1-11 months), followed by 21.5% (more than one year to three years). While the lowest percentage (15.1%) of the participants belonging to ages (3-4years). Regarding sex, the results report that 55.8% of the children were females, and 44.2% of the children were males. Regarding residence, the present study found that the highest percentage (26.8%) of the children with measles living in AL-Dora distract, while the lowest percentage (1.1%) of the children with measles living in AL-Mahmudiya. The study found that 66 (42.9%) of 154 children older than 11 months children were vaccinated against measles.

2-Clinical features of measles

In Table 2, the current results found that the highest percentages (100.0%, 99.6%, and 71.3%) of the children with measles suffering from fever, maculopapular rash, and cough respectively. While the very low number of the children with measles suffering from gastro-enteritis, conjunctivitis.

3-Socio-demographic characteristics of mother

In Table 3the study shows that most mothers were aged 20–29 (50.6%), with the majority having primary education (40.4%) or basic literacy (39.6%). Only 44.5% had received a measles vaccine. A significant portion (64.5%) lived in crowded conditions, and over half had moderate income and socio-economic status.

4- Relationships:

Table 4; represent the association between vaccination status and socio-demographic characteristics of mother. The study explains that high education of the mother tending to positive vaccination status.

Table 5; represent the association between vaccination status and clinical features. The results show significant statistical association between vaccination status and conjunctivitis in which p. value <0.05.

Table (1): The distribution of children with measles according to demographic characteristics

Demographic characteristics of the patients with measles		No.	%
Age groups	1-11 months	111	41.9
	1-2years	57	21.5
	2-3years	57	21.5
	3-4years	40	15.1
Sex	Male	117	44.2
	Female	148	55.8
Residency	AL-Wihda	12	4.5
	AL-Baladiyat	10	3.8
	AL-Sader	31	11.7
	Baghdad ALJadida	48	18.1
	AL-Dora	71	26.8
	AL-Madain	39	14.7
	AL-Shaab	46	17.4
	AL-Mahmudiya	3	1.1
	AL-Azamiyah	5	1.9
Vaccination status	Yes	66	42.9
	No	88	57.1

Table (2): The distribution of children with measles according to clinical feature

Clinical features	Yes		No	
	No.	%	No.	%
Fever	265	100.0	0	.0
Maculopapular Rash	264	99.6	1	.4
Cough	189	71.3	76	28.7
Gastro-entiritis	10	3.8	255	96.2
Conjunctivitis	6	2.3	259	97.7
Patient need admission	169	63,8	96	36,2

Table (3): The distribution of the parents according to socio-demographic characteristics of mother

Socio-demographic characteristics of mother		No.	%
Mother age	less than 20	28	10.6
	20-29 years	134	50.6
	30-39 years	101	38.1
	40-49 years	2	0.8
Mother education level	Reading and writing	105	39.6
	Primary	107	40.4
	Secondary	40	15.1
	College and above	13	4.9
The mother received vaccine	Yes	118	44.5
	No	147	55.5
Crowded index	Positive	171	64.5
	Negative	94	35.5
Income Level	Insufficient	71	26.8
	Moderate	141	53.2
	Sufficient	53	20.0

Table (4): The association between vaccination status and sociodemographic characteristics of mother

No. = 154		Vaccination status				P-value
		Yes		No		
		No.	%	No.	%	
Mother age	less than 20	2	25.0	6	75.0	0.293
	20-29 years	38	42.7	51	57.3	
	30-39 years	24	43.6	31	56.4	
	40-49 years	2	100.0	0	.0	
Mother education level	Reading and writing	24	45.3	29	54.7	**0.005**
	Primary	22	30.6	50	69.4	
	Secondary	13	68.4	6	31.6	
	Collage and above	7	**70.0**	3	30.0	
The mother received vaccine	Yes	38	48.1	41	51.9	0.177
	No	28	37.3	47	62.7	
Crowded index	Positive	45	45.5	54	54.5	0.382
	Negative	21	38.2	34	61.8	
Income level	Insufficient	15	40.5	22	59.5	0.676
	Moderate	36	41.4	51	58.6	
	Sufficient	15	50.0	15	50.0	

Table (5): The association between vaccination status and clinical feature

		vaccination status				P-value
		Yes		No		
		No.	%	No.	%	
Fever	Yes	66	42.9	88	57.1	-
	No	0	.0	0	.0	
Rash	Yes	65	42.5	88	57.5	0.247
	No	1	100.0	0	.0	
Respiratory symptoms	Yes	44	42.3	60	57.7	0.842
	No	22	44.0	28	56.0	
Gastro-entireties	Yes	2	66.7	1	33.3	0.400
	No	64	42.4	87	57.6	
Conjunctivitis	Yes	0	.0	5	**100.0**	**0.049**
	No	66	44.3	83	55.7	

Discussion

Significant resurgence of measles occurred in Iraq during the period of 2023-2024. A retrospective cross-sectional study analyzing data from January 2023 to August 2024 revealed that the measles incidence increased from 22.1 to 69.3 cases per 100,000 Population. [14]

1-Demographic Characteristics
The highest proportion of cases (41.9%) occurred in children aged 1-11 months which is agree with study done by Adnan H. Aljothery (Epidemiologic and Clinical Characteristics of Children with Measles during the Year 2019) [14] that show one third of cases below one years 2 and is similar to the reported result by Choe YJ et al. in Republic of Korea, [15] likely due to incomplete vaccination or waning maternal immunity. Slightly more female cases (55.8%) were reported, though the difference is not substantial which is disagree with study done by Adnan H. Aljothery (Epidemiologic and Clinical Characteristics of Children with Measles during the Year 2019) [14] that males are infected slightly more than females and disagree with another local study conducted in Baghdad province by Aziz HA et al 13 4.[16] AL Dora district had the highest case concentration (26,8%) which could indicate localized outbreaks or population density factors. Only 42.9% of children over 11 months were vaccinated, indicating gaps in immunization coverage and possible vaccine failure this finding is similar to the finding of study done by Adnan H. Aljothery (Epidemiologic and Clinical Characteristics of Children with Measles during the Year 2019). [17] and similar to study done in Monfort et al. conducted a study on a measles outbreak in Barcelona showing that 23.6% of patients had been vaccinated against measles. [18]
2-Clinical Features:
Most children had fever and maculopapular rash; cough was present in (71%). Other symptoms like conjunctivitis and gastroenteritis were less common (63%) of cases required hospitalization for complications (mainly pneumonia), especially among children under 2 years. No mortality was reported. which is agree to study done by Mohammed shaker Al-Awady (M.B.CH. B, F.I.C.MS) Department of pediatric –AL-Imam Ali hospital, Baghdad-Iraq (Causes of Measles Outbreak in Al-Sader city-Baghdad/Iraq) [19] and other study done in Italy. [20]
3- Contact History and Infection Sources:
Only (43.8%) of cases had known contact with infected individuals. (55.5%) had unknown sources of infection, reflecting difficulty in tracing transmission chains. The result is similar to study done by Monfort et al. conducted a study on a measles outbreak in Barcelona,[18]. But is very low compare with study done by Mohammed shaker Al-Awady (M.B.CH.B F.I.C.MS) Department of pediatric –AL-Imam Ali hospital, Baghdad-Iraq (Causes of Measles Outbreak in Al-Sader city-Baghdad/Iraq) showing that (97.1%) of patients with measles were had contact with infected cases.[15]
4- Socio-Demographic Characteristics of mother:
Most mothers were aged 20–29 years and only (40,4%) had primary education. Only (44.5%) of mothers were vaccinated. Families often had moderate income and high household crowding, suggesting socioeconomic factors contributed to the outbreak.

5- Associations Factors:

A strong association was found between child vaccination status and maternal education/socioeconomic level. Which is agree to study done by Mohammed shaker Al-Awady (MBChB F.I.C.MS) Department of pediatric –AL-Imam Ali hospital, Baghdad-Iraq (Causes of Measles Outbreak in Al-Sader city-Baghdad/Iraq) as vaccination rate is low in low socioeconomic. [21] Clinical symptoms (especially respiratory and eye-related) were more severe in younger children, particularly those under 2 years.

Limitation of the study:

1- The study did not confirm the suspected cases of measles by serological test as not all patient undergone serological investigation.
2- The short duration of data collection and resolution of outbreak due to massive vaccination against measles leading to small sample size.
3- the small sample size may not represent the actual number of cases as many cases may be mild and not seek medical services or may receive treatment in outpatient clinic.
4- Difficulty to follow-up patients to detect long term complication.

Conclusions:

The cluster of cases in certain cities and among families with low socioeconomic status suggests inequities in healthcare access and preventive measures. The high percentage of unknown infection sources points to gaps in public health measures for tracking and containing outbreaks.

The correlation between parental education and vaccination highlights the importance of addressing educational barriers to improve vaccine uptake.

Recommendations:

1 .Strengthen vaccination programs, particularly targeting underserved city

2 .Implement public awareness campaigns focusing on the importance of childhood immunization.

3 .Improve surveillance and contact tracing systems to identify and control outbreaks more effectively.

4 .Address socioeconomic disparities by integrating healthcare access with broader social support systems.

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