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## Measles among Adolescents and Young Adults Hospitalized in Merjan Teaching Hospital-Babylon during the 2008-2009 Epidemic

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### Abstract

**Background:** Despite the launch of the national plan for measles elimination, in Iraq, immunization coverage remains suboptimal and outbreaks continue to occur.

**Objectives:** To study the epidemiologic and clinical characteristics of measles adolescents and adult patients admitted to Medical Merjan City Babylon, Iraq.

**Patients and Methods:** This is a cross sectional study carried out during the last epidemic that took place in Babylon during the year 2008- 2009. The study included all patients aged 11 years and above from the first of May 2008, through the end of April, 2009, interviewing of patients were carried out by trained medical staff using a structured questionnaire to collect demographic and clinical data about the cases. Diagnosis was done according to WHO criteria.

**Results:** This study reveals that the overall incidence rate of measles was (59 per 100,000 persons) and the highest incidence (71/100,000 persons) was among dwellers in Al-Hilla city (urban area). Most of the cases occurred in winter and spring seasons. The highest proportion of cases was in the age group 21-25 years of age (31.8%). Male to female ratio was 1.1: 1. The most common signs and symptoms among the studied patients were rash, fever and cough which constituted 100%, 99, 94%, respectively. Pneumonia and diarrhea were the main complications, 2 pregnant females died with a case fatality rate during pregnancy (1.5%). Among 130 pregnant women three abortions (2.3%) and five women delivered prematurely (3.8%).

**Conclusions:** These cases underline the potential severity of this infection and the difficulty to diagnose measles at the early phase the successful elimination of measles in our country will require additional efforts to immunize low vaccine coverage population groups, including hard-to-reach individuals, adolescents, and young adults and an enhanced surveillance system.

**Keywords:** Epidemiology, measles, Adolescents, young adults, outbreak, Babylon, Iraq.

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### Introduction

Measles is the most infectious virus known to humans, despite the preventive measure (live measles vaccine), measles continues to cause more deaths than any other single infectious agent<sup>(1,2)</sup>. It is responsible for one third mortality attributable to all vaccine six preventable diseases<sup>(3)</sup>.

Despite the availability of a safe and effective vaccine. It has been estimated that 30 million people contract measles every year and that nearly one million die, many of the cases occur in young adults and adolescents worldwide<sup>(4-6)</sup>. Measles virus is one of the most highly contagious, directly transmitted pathogens, and outbreaks can occur in populations in which fewer than 10% of people are susceptible<sup>(7)</sup>.

No latent or persistent measles virus infections result in prolonged contagiousness and there are no animal reservoirs that maintain virus transmission features that make eradication possible. Measles virus can only be maintained in human populations by an unbroken chain of acute infections<sup>(8)</sup>. The 23 member countries of the World Health Organization (WHO) Eastern Mediterranean Region resolved to eliminate measles from the region<sup>(9)</sup>.

The incidence of measles had shown a remarkable decline in our country in late 1980s and during 1990s due to routine administration of live attenuated vaccine at ages of 9 and 15 months<sup>(10)</sup>. Measles is naturally a disease of childhood and like many other viral infections is more severe in adults than in children.

About 3% of adults develop primary pneumonia and require hospitalization<sup>(11)</sup>.

In temperate climates, yearly measles outbreaks typically occur in the late winter and early spring. These seasonal outbreaks result in part from

facilitation of transmission through social networks (e.g. congregation of at school) and environmental factors that favor the viability and transmission of measles virus<sup>(12)</sup>.

This study was carried out to describe clinically and epidemiologically the measles among adult and adolescent patients admitted to Merjan Teaching Hospital in Babylon province during the 2008-2009 measles epidemic.

### Methodology

A cross section study was extended over a one year period from May 2008 through May, 2009, subjects included all cases above 11 years of age who were admitted to the fever wards of *Merjan teaching hospital* in Babylon Province (this hospital is the only referral hospital in the province with infectious wards for only adult patients). Informed consents of patients and their parents were taken after explaining to them the objectives and the methods of study, the approval of the ministry of health and the community medicine departments committees were obtained. Verification of diagnosis was in accordance with the WHO case definition of measles<sup>(13)</sup>. A pre-designed questionnaire was used to interview patients or their parents, this questionnaire included items pertaining to the demographic characteristics (age, sex and occupation), clinical presentation (typical rash, fever, cough, and Koplik's spot) and post measles complications (pneumonia, diarrhea, blood in the stool, abortion). In addition, the permanent residence of patients (urban or rural) was recorded. History of measles vaccination was ascertained by comparing the answer of the patients with the case sheet surveillance form filled by the primary health care surveillance staff. Data about the

total number of population in Babylon province were obtained from the Babil Statistical Directorate to estimate the incidence rates of the severe cases of measles among young adult people in the province and in its main four counties (Hilla City Center, AlHashmia, Almusiab and Al Mahaweel Counties). An Analysis of data was performed using SPSS (version 17). The level of significance chosen was  $<0.05$ .

### Results:

Table 1 shows that the overall incidence rate of measles cases admitted to hospital was 59% and the highest incidence rate was in Hilla city centre Table 2 shows that the large proportion of cases were not vaccinated (40.8), while 29.2% of cases had mentioned that they received at least the measles vaccine during their early childhood, 30% of patients didn't know their vaccination status.. Table: 3 shows that the most common age group affected in this study was 21-25years (33.8%) followed by the age group between 11-15years which constituted (24.9%). Very few patients were above the age of 40 years. This table clarified that all ages are at risk and susceptible to this highly contagious disease .Table 7

shows that the vaccinated patients were higher in the young age group ( $P<0.01$ ). Table (4) reveals that the frequency of measles cases was skewed slightly to the male side , the Male to Female Ratio 1.1:1 Tables 4 and 7 reveals that the male to female ratio among the study group was 1.1:1 and the {OR =1.51 CI 1.149-1.985} Tables 5 and 7 show that about three fourths (69%) of cases were living in rural districts (villages), a significant association was found between permanent residency and having severe measles lead to admission { $X^2=41.830$  ,OR=2.963 CI (2.112-4.156)}. Table 6 shows that the highest incidence of cases occurred in February and March 18.5% and 17.6% respectively, (late winter and spring seasons) while the lowest rates in both September and October 2.5% (Autumn season) so cases were highly admitted during winter and spring seasons {OR=4.959 (3.014-8.159)}.

Figure 1 shows that the most common signs and symptoms were rash, fever and cough. Table 8 shows that among 130 pregnant women the abortion rate premature labor rate and case fatality rate among pregnant patients were 2.3%, 3.8%, 1.5% respectively.

**Table 1:** Distribution of incidence rates of adult cases of measles by districts during the 2008-2009 epidemic

District	No. of population	No. of cases	Incidence rate per 100 000
Alhashimia	401773	181	45
Almusaib	359111	170	47
Almahaweel	274409	162	59
Alhilla city	731837	521	71
<b>Babylon province</b>	<b>1767130</b>	<b>1034</b>	<b>59</b>

**Table 2:** Distribution of admitted adult cases of measles by vaccinal status during the 2008-2009 epidemic.

Vaccinal status	Frequency	Percentage (%)
<b>Vaccinated</b>	302	29.2
<b>Non-vaccinated</b>	422	40.8
<b>Unknown</b>	310	30.0
<b>Total</b>	1034	100.0

**Table 3:** Distribution of admitted adult cases of measles by age during the 2008-2009 epidemics

Age groups (years)	No.	(%)
<b>11-15 years</b>	257	24.9
<b>16- 20 years</b>	235	22.7
<b>21- 25 years</b>	329	31.8
<b>26- 30 years</b>	127	12.3
<b>31- 35 years</b>	56	5.4
<b>36- 40 years</b>	22	2.1
<b>41- 45 years</b>	5	0.5
<b>46- 50 years</b>	3	0.3
<b>Total</b>	<b>1034</b>	<b>100.0</b>

**Table 4:** Distribution of admitted adult cases of measles by gender during the 2008-2009 epidemic

Gender	No.	Frequency (%)
Male	563	54.4
Female	471	45.6
Total	1034	100.0

Male: Female Ratio 1.1:1

**Table 5:** Distribution of admitted adult cases of measles by permanent residency during the 2008-2009 epidemic

Residency	No.	(%)
Rural area	713	69.0
Urban area	321	31.0
Total	1034	100.0

**Table 6:** Distribution of admitted adult cases of measles by months during the 2008-2009 epidemics

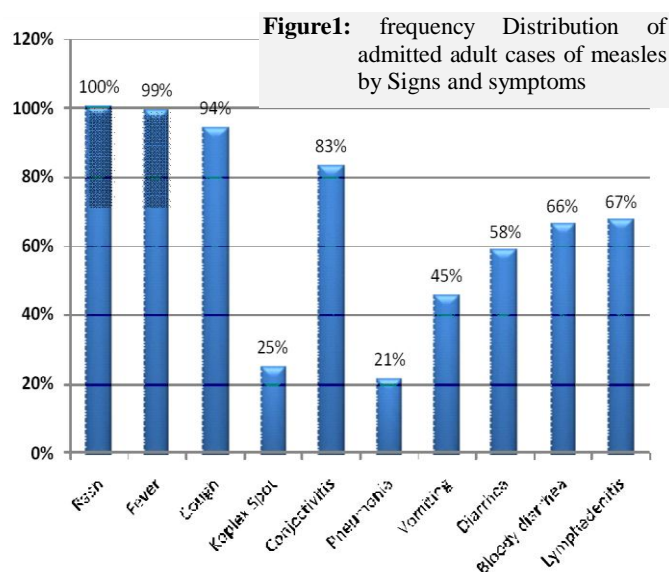
Occurrence (Months)	No.	(%)
January	114	11.0
February	191	18.5
March	182	17.6
April	114	11.0
May	113	10.9
June	66	6.4
July	66	6.4
August	63	6.1
September	26	2.5
October	26	2.5
November	33	3.2
December	40	3.9
Total	1034	100.0

**Table7:** Association between measles vaccination and its risk factors

Variable	Measles		$\chi^2$	d.f	P values	Odds Ratio (95% CI)
	Vaccinated (%)	Non-Vaccinated (%)				
Age group						
<20 years	232 (76.8)	232 (31.7)	201.38	2	<0.001*	7.933 (4.096- 15.366) 0.833 (0.448- 1.550)
20- 40 years	50 (16.6)	476 (65.0)				
≥ 40 years	20 (6.6)	24 (3.3)				
Sex						
Male	186 (61.6)	377 (54.4)	8.77	1	0.003*	1.510 (1.149-1.985)
Female	116 (38.4)	355 (48.5)				
Seasons						
Winter	152 (50.3)	335 (45.8)	44.255	3	<0.001*	4.959 (3.014- 8.159) 2.249 (1.451-3.485) 2.143 (1.276- 3.598)
Spring	50 (16.6)	243 (33.2)				
Summer	48 (16.1)	105 (14.3)				
Autumn	52 (17.0)	49 (6.7)				
Residency						
Urban	252 (83.4)	461 (63.0)	41.830	1	<0.001*	2.963 (2.112-4.156)
Rural	50 (16.6)	271 (37.0)				

**Table 8:** Distribution of pregnant women with measles according to the outcome of pregnancy

Complication	No.	%
Abortion	3	2.3
Premature labour	5	3.8
Case Fatality Rate	2	1.5
Without complications	120	92.4
Total	130	100%



## Discussion

The nationwide outbreak of measles in Iraq during the year 2008-2009 was characterized by its long duration. The usual length of this outbreak is probably the result of the proportion and distribution of susceptible person in the population allowing for the accumulation of a large number of susceptible individuals<sup>(14,15,16)</sup>.

Even in areas where vaccine coverage rates are high, outbreaks may still occur. Periods of low incidence (the "honeymoon" effect) may be followed by a pattern of periodic measles outbreaks. Outbreaks are generally due to the accumulation of persons susceptible to measles virus, including both unvaccinated persons and those who were vaccinated but failed to seroconvert. Approximately 15% of children vaccinated at 9 months of age and 5%–10% of those vaccinated at 12 months of age fail to seroconvert, and are thus not protected after vaccination<sup>(21)</sup>.

Jasem J and his coworkers studied the epidemiologic and the evaluations of the surveillance systems in Iraq during the period 2005-2010 and they found that out of 18 746 suspected cases, a measles diagnosis was made for 81.4%. Children aged 1-5 years were the most affected (48%) and the odds of measles were significantly higher in the central and southern provinces (including Babylon province) than in the Northern provinces.<sup>(17)</sup>

During this period unusually high incident cases were reported in Babylon province and a large un expected number of cases occurred among adolescents and young adults, some of them (1034) were severely ill and deceiving hospitalization, This may indicate that the number of new measles cases reported by Jasem et al was under estimated and this may be due to poor measles surveillance system in Iraq.

The overall incidence rate of sever measles cases (need to be hospitalized ) was 59 per 100000 persons which was much higher than the overall incidence rate reported in Gonabad – Iran (12/100000 persons) (18). The incidence rate in this work is much higher than that of the whole Islamic Republic of Iran<sup>(19)</sup> such prolonged epidemic of the disease took place in many south and central Iraqi provinces during the period 2008-2009 despite that the Eastern Mediterranean member countries including Iraq had adopted in 1997 a resolution for elimination of measles from the region by the year 2010<sup>(20)</sup>. Following Iraq adoption and implementation of measles Elimination Strategies in 2004 the average annual reported measles cases dropped from 9400 cases to around 1000 cases annually<sup>(21)</sup>.

This study showed that the majority of young adults admitted to the hospital were in the age group 21-25 years (31.8%), in densely populated settings with low vaccination coverage, measles mainly affects infants and young children. As measles vaccine

coverage increases, or population density decreases, the age distribution shifts towards older children. As vaccination coverage is high, and thus population immunity, increases further, the age distribution of cases might shift into adolescence and adulthood<sup>(8)</sup>. Analysis of the vaccination status of measles cases in our district indicates that 29.2% of clinically and serologically diagnosed measles cases had received at least 1 dose of vaccine, suggesting a high rate of vaccine failure. This is high compared with other studies. For example, in a study that was performed in Iran the rate was 9%<sup>(19)</sup> and in a study in India it was 19.7%<sup>(22)</sup>. Our finding raise concern about vaccination failure, report about vaccinated cases of measles lead to loss of confidence in the programs and may lead to a lack of community motivation seeking and supporting vaccination programs. Vaccination failure may be due to immunization at less than one year of age, or administration of nonviable vaccine, low potency vaccine that may have been improperly stored or handled<sup>(23)</sup>. Understanding the reasons for primary and secondary vaccine failures is important for evaluation of measles control programs in the developing countries, the estimation of IgG antibody avidity is useful for identifying primary and secondary immune response , but there have been few reports of its use in measles outbreaks<sup>(24,25)</sup>.

Regarding the sex difference this, study shows that males were slightly higher, this is similar to most other infectious diseases, in which disease severity and mortality is higher in males<sup>(26)</sup>, this finding agreed with the finding of other researcher in Iran Ghazvln<sup>(19)</sup>. Moreover, there is a significant high vaccine converge rate among males which disagreed with the result of other study<sup>(27)</sup>.

Incidence of measles in rural areas was higher than in urban areas which may suggest low population density which leads to shifting to older age groups<sup>(8)</sup>. This might have been also the result of inadequate health care, low level of public awareness and high rate of poverty and malnutrition in these districts. This work found that the peak incidence of measles cases admitted during winter and spring seasons this in accordance with the findings of other local study<sup>(16,17)</sup> and studies outside the country<sup>(23)</sup>, seasonal variations probably related to social and human habits more than any effects of climate on the virus . In winter people crowd together indoors and allow the shot live virus a much better chance to spread than when they remain outdoors<sup>(28)</sup>. The most frequently encountered signs and symptoms in the present study are rash, fever cough, conjunctivitis which was similar to what was reported in other studies<sup>(29,30)</sup>. In the present work, gastrointestinal complications and diarrhea occurred in the majority of cases .diarrhea was doubtlessly due to invasion of the gastrointestinal epithelium in addition damage might also increase susceptibility to some pathogen which

may cause bloody diarrhea<sup>(23,28)</sup>. Pregnancy is a high risk situation for measles. Complications from measles during pregnancy may be higher than expected for age-comparable, non-pregnant women<sup>(31)</sup>. The pregnant females in this study were 130, the pregnancy outcomes were normal in most of them although prematurity (3.8%), abortions (2.3%). In addition, the incidence of death was (1.5%). Measles during pregnancy usually associated with spontaneous abortion and with delivery of low birth weight infants<sup>(32)</sup>.

#### Limitations of the study:

Certain limitations in this study should be taken in account firstly this study was a hospital based one and may be unrepresentative to the whole measles cases because we studied the severe cases among adults only, measles cases among children usually admitted to child hospitals in the province and this study doesn't examine the non admitted measles cases. Secondly: admitted cases may be admitted to other hospitals in the near provinces specially those who live in remote area, far away from Merjan hospital. Thirdly this study is a cross sectional one, depends on part of it on interviewing patients reflecting a recall bias. Fourthly concerning the study design, we must consider that vaccination status is self-reported, and a possible recall bias

could have occurred since almost all patients involved did not supply a vaccination certificate, and thus results could have been distorted. Finally due to the cross-sectional study the factors have been identified as associated with vaccination cannot be described in causation relationship

#### Conclusions

Considerable number of young adults was affected by measles epidemic despite the routine vaccination campaigns and the application of measles elimination programs a large number of pregnant women getting this disease and the outcome showed important problems of maternal deaths, abortion and premature labor. High Incidence of hospitalized cases was among the age group 21-25 years and in winter, spring seasons and among rural dwellers

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#### References

1. Hersh BS, Andrus JK. Tropical Infectious Diseases (Second Edition) Principles, Pathogens, & Practice Churchill living stone 2006, P:78–585
2. Valleron, A.J. Mortality and morbidity worldwide, now and tomorrow: what is known? *Journal of Comptes Rendus Biologies*. 2008. 331(12) P: 991-1006.
3. Dhaar GM and Robbani I. *Foundation of Community Medicine*. 2<sup>nd</sup> ed. Elsevier, 2008, p: 413-415.
4. Hersh Bs et al. Review of regional measles surveillance data in Americas 1996-99. *Lancet* 355 (92190, 2000:143-8.
5. Center for Disease Control and Prevention. progress towards measles elimination – Region of Americas 200-2003, Morbidity and Mortality, Weekly report. 2004, 53 (14):304-6
6. Saffar MJ, Amiri MA, Baba –Mohamadi F et al. *EMHJ*, 2006 12(5): 104 –
7. NJ Gay The theory of measles elimination: implications for the design of elimination strategies. *J Infect Dis*, 189 (suppl 1) (2004), pp. S27–S35
8. Moss WJ, Griffin D. Measles. *Lancet*. 2012, 379(9811) p: 153-164.
9. Forty-fourth Session of the Regional Committee for the Eastern Mediterranean Teheran, Islamic Republic of Iran, 4 to 7 October 1997. Resolutions. Available at [http://www.emro.who.int/governance/PDF/RC44\\_Resolutions.pdf](http://www.emro.who.int/governance/PDF/RC44_Resolutions.pdf) (accessed 23 September 2005).
10. Iraqi Ministry of Health and WHO Representative office in Iraq, National plan to eliminate measles by 2011, Ministry of Health report 2007.
11. Fine PE, Klarkson JA. Measles in England and Wales: an analysis of factors underlying seasonal patterns. *Int J Epidemiol*, 11 (1992), p: 5–14.
12. Ferrari MJ, Grais RF, Bharti N *et al*. The dynamics of measles in sub-Saharan Africa. *Nature*, (2008), 451 p: 679–684
13. Expanded programme on immunization. Measles control in 1990s: plan of action for global measles control. Geneva, World Health Organization, 1992 (WHO/EPI/GEN/92.3), 3-41
14. K. Park. *Park's Textbook of Preventive and Social Medicine*. 19<sup>th</sup> Ed., 2007. P:127-129
15. Robert B, Wallace MD. *Wallace/Maxy-Rosenau-Last ;Public Health and Preventive Medicine*. 19<sup>th</sup> ed. McGraw Hill. 2008 P:101-105
16. Alhuzai AF Clinicoepidemiological study of measles outbreak in Aldiwanya governorate-Iraq during the year 2009 A thesis submitted for the degree of diploma in family medicine Babylon university- college of medicine –community department. 2011 P:31-33
17. Jasem J, Marof K, Nawar A, Monirul Islam Km. Epidemiological analysis of measles and evaluation of measles surveillance system in Iraq, 2005-2010. *International Journal of infectious disease*. 2012, 16(3) p:165-171.

18. Zahra SM, Dadras MN, Sabori A .National guideline for measles surveillance ,(elimination phase ).3<sup>rd</sup> edition ,Iran,2009 ,8 :41
19. Asefzadeh M, pyrovian M. Epidemiological study of measles in Ghazvin, Islamic Republic of Iran, April 1997–April 2003. *Emhj*, 2006; 12 1/2 P: 15-20.
20. WHO, the work of WHO in the Eastern Mediterranean Region- annual report of the regional director, Egypt, WHO, 1997,P: 109-111.
21. Measles & Rubella Surveillance Field Manual Measles & Rubella Surveillance Fiel Manual For Communicable Diseases Surveillance Staff WHO-MOH IRAQ 2009 p:1-10.
22. Ray SK et al. Epidemiological study of measles in slum areas of Kolkata. *Indian journal of pediatrics*, 2004, 71(7):583–6.
23. Tyil SE. El- Shazly SM, Al –Amrawy FM et al .Sero - epidemiological study of measles after 15 years of compulsory vaccination in Alexandria, Egypt . *EMHJ*, 1998, 4(3),p: 437-447.
24. Pannuti SC et al .Identification of primary and secondary measles vaccine failures by measurements of immunoglobulin G avidity in measles cases during the 1997 Sao Paulo epidemic. *Clinical and diagnostic Laboratory immunology*, 2004, 11 p: 119-122.
25. Hamkar R. Mahmood R. Nategh KN et al .Distinguishing between primary measles infection and vaccine failure reinjection by IgG avidity assay .*EMHJ*, 2006, 12 (6), P: 775-782.
26. SL Klein, C Roberts (Eds.), *Sex hormones and immunity to infection*, Springer-Verlag, Berlin and Heidelberg, Germany (2010), p: 281–302.
27. Bhagyalaxami A, Rawal VS, Kedia G .Study of incidence of measles and vaccination coverage in Ahmadabad Urban Slums .*Indian Journal of Public Health* .2007 , 51 (1) p: 100-104.
28. Christie AB. *Infectious disease epidemiology and clinical practice* .4t ed. Edinburgh, London, Melbourne and Newyork.1987 p: 541-80.
29. Sixty third World Health Assembly agenda professional, items 11, 15, Global eradication of measles .[http://apps.who.int/gh/ebwha/pdf\\_files/WHA63\\_18-en, pdf](http://apps.who.int/gh/ebwha/pdf_files/WHA63_18-en.pdf). Retrieved 2 June 2010.
30. Rahim A. *Principles and practice of community medicine*. 1<sup>st</sup> ed. Jaypee; 2008 P153-54.
31. W.J. Bellani, J.P. Icenogle .Measles and rubella viruses. In P.R. Murray, E.J. Baron, J.H. Jorgensen (Eds.), *Manual of clinical microbiology* (9th ed.), vol. 2American Society for Microbiology, Washington (2007), pp. 1378–1391.
32. Wallace RB, Kohatsu N. *public Health and Preventive Medicine* .15<sup>th</sup> ed. McGraw Hill Medical .2008 p; 104-105.

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