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SUSCEPTIBILITY FOR MEASLES INFECTION AMONG YOUNG ADULTS

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ABSTRACT

Measles is a highly contagious viral infection, its incidence has declined significantly in many countries .Measles transmission can be prevented through high population immunity (≥95%) achieved by measles vaccination. Estimation of measles IgG antibodies (Abs), in the serum of healthy adults for identification of their susceptibility to measles. A sero-surveys for measles IgG Abs. was conducted to estimate immunity among (156) healthy young adults aged 18-25 years, (58) were males and (98) were females, randomly selected from Diyala medical students for the academic year 2011-2012. Data about the participants was collected using special questionnaire designed by the researchers. Serum samples were tested by the Enzyme-Linked Immunosorbent Assay method ELISA using a standard kit (Dade Behring), for the qualitative detection and quantitative determination of measles IgG Abs in human serum. Prevalence of measles IgG Abs. among healthy adults was 68%, while 32 % of the study sample who born in the vaccine era have negative measles IgG Abs. titer. Immunity was higher among females 58.3%, than males (40.7%). Mean measles IgG Abs. titer was positive (0.294mIU/ml). Participants with serum positive for measlesIgG antibodies were considered protected or immune to measles infection. As the Prevalence rate of measles IgG Abs was 68% of the participants, so immunity among the study sample was low; and recommendation to health care providers to evaluate measles susceptibility of individuals born in the vaccine era and vaccinate eligible persons.

Keywords: Measles, Sero-Prevalence, Measles IgG Antibodies, Adults Susceptibility to Measles

INTRODUCTION

Measles is a highly contagious viral infection, can be prevented through high population immunity (≥95%) achieved by measles vaccination **[1]**. Prior to the

introduction of vaccine, most people acquired immunity through infection with wild measles virus in childhood **[2]**. Measles morbidity had been reduced greatly since measles containing vaccine (MCV) was introduced in 1966 , while in Australia the availability of measles vaccine in 1968 lead to a reduction in circulating wild measles virus, reflected in decreased measles and measles encephalitis (2&3)**.**

The simplest of all viral disease is measles' which is an antigenically complex virus, but few components of the immune response to this virus are epidemiologically relevant. The relevant components are durable for a lifetime **[3]**. They can be conveniently measured by serological tests, and the results of these tests correlate well with measles immunity. The tests show that measles is an extremely infectious disease, and that very high antibody prevalence rates are needed for herd protection. **[1, 3]**.

The annual number of reported measles cases in the United States has declined from between 3 million and 4 million in the pre-vaccine era, to <100 cases in association with the highest recorded immunization rates in history. Because of continued importation of measles into the United States, young children who are not vaccinated appropriately may experience more than a 60-fold increase in risk of disease **[4]**. Unsubstantiated claims suggesting an association between measles vaccine and neurologic disorders have led to reduced vaccine use and a resurgence of measles in countries where immunization rates have declined below the level needed to maintain herd immunity. To address the possibility of worldwide control of measles, efforts to ensure high immunization rates among people in both developing and developed countries must be sustained **[4, 5]**.

According to the National Notifiable Diseases Reporting System (NNDRS), the annual reported measles incidence rate had decreased in Zhejiang Province. Especially after MCV was included in the Expanded Program on Immunization (EPI) of China in 1978, the reported number of measles cases decreased rapidly to 103.68 per 100,000 (1978–1985). After implementation of the 2-dose schedule (at 8 months and 7 years old) in 1986, the average reported measles incidence rate subsequently reached the lowest level, 10.62 per 100,000 (1986–2004) **[4]**.The currently available measles vaccine is capable of yielding adequate antibody prevalence rates for herd immunity, but to achieve this, immunization procedural flaws and faulty records must be kept to very low levels. The greatest obstacle to worldwide control of measles is a failure of vaccination programs to produce adequate herd immunity levels in less-

developed countries **[1, 2]**. The aim of current study is estimation of measles IgG antibodies (Abs), in the serum of healthy adults for identification of their susceptibility to measles.

SUBJECTS AND METHODS

A cross – sectional study, was conducted in Diyala Medical College for the period from 1st of October 2011, to the 31st of March 2012. Sero-survay was done for a selected random sample of medical students, aged 19-25 years. The study sample was (156) healthy medical students, of them 58 (36.8%) were males, and 98 (63.2%) were females. Serum samples were collected and analyzed from the study sample for estimation of specific measles IgG Abs titers, prior to their submission to vaccination by measles containing vaccine (MCV) during National Measles, Mumps & Rubella campaign 2011. Testing of serum samples were performed at the National reference laboratory for measles in the Central Public health Laboratory belong to the Ministry of Health (CPHL / MoH) in Baghdad City (Capital of Iraq). This laboratory was accredited by World health Organization (WHO), as one of reference laboratories in Eastern Mediterranean region for measles. Testing was done using the Enzygnost (Dade Behring, Marburg-Germany) commercial measles IgG enzyme immunoassay (IA). Using the alpha formula provided, the manufacturer's instructions for the calculation of immunoglobulin class G (IgG) concentration based on optical density (OD), were followed and immunity was determined (positive) as an OD = + > 0.2, which is equivalent to approximately 330 – 1909 milli-International Units per milliliter (mIU/ml). OD = < 0.1 (cut off), determined as negative which is equivalent to less than 330 mIU/ml. Equivocal samples (> 0.1- < 0.2) were retested and reclassified as positive or negative, where indicated. Final equivocal results were counted as non-immune.

RESULTS

With respect to the subjects "**Age Groups**", the majority of the sample were reported at the age ranged (20 – 24) yrs. and they are accounted 135 (87.1%) with mean value and standard deviation 22.11 and 1.64 respectively.

Relative to subject of "Gender", results indicated that a highest percentage of the study sample is "Female", and they are accounted for 98 (63.2%).

Regarding to the subjects "BMI", the greater number of them illustrated normal level, and they are accounted 78 (50.3%), and whatever to that those whom had overweight and obesity were reported too highly numbers due to the selected sample's age, and they are accounted 55 (35.5%).

Figure 1 represented graphically the percentages of the studied characteristics variables of the study sample.

Regarding to the subject of immunity to measles, as illustrated in **Table 2, 3**, the studied volunteers whom were tested there serum for measles IgG Abs., 67.1% of them had immunity to measles. Female immunity was higher than males (59.3%, 40.7%) respectively. On the other hand 32.9% had no immunity.

Table 4 shows the summary statistics with comparison significant of measles IgG Abs titer for participants' samples who gave two samples first sample before vaccination and second sample four weeks after revaccination. The result indicating that actual difference has been occurred according to the effectiveness of IgG Abs titer at the two periods, and that accounted a highly significant different at P<0.01 with meaningful increasing of titer at the post period (after vaccination), as well as a meaningful correlation - ship has reported at all the studied volunteers according to their IgG Abs titer along the studied periods.

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DISCUSSION

The greatest obstacle to worldwide control of measles is a failure of vaccination programs to produce adequate herd immunity levels in less-developed countries. For estimation of adults' susceptibility to measles infection, current sero-prevalence survey for measles IgG Abs was conducted among 156 participants aged 18-25 years as a selected sample from Diyala medical students, who presented their willingness for participation through an informal consent. The adjusted overall seropositivity rate of measles was 67.1 %, with higher immunity rate among females (59.1%), than male's students whose immunity was (40.1%).

Results of the current study was lower than the immunity found in **[4]**, seroprevalence of measles IgG antibody which was conducted among 1961 participants aged 0–60 years randomly selected by age-stratified purpose sampling, and the effect of re-vaccination program in secondary school was evaluated in Chines City, Zhejiang Province. The adjusted overall seropositivity rate was 88% (95%

confidence interval [CI]): with geometric mean titers (GMT), 976 ± 86 mIU/ml **[4]**.

Several conditions, including pockets of under-immunization, international importation, and the inability to rapidly detect and contain cases, represent potential threats to this success of measles elimination **[9, 10]**.The increasing proportions of adult cases were observed in the last measles outbreaks in Diyala 2008-2009 **[11]**.

The currently available measles vaccine is capable of yielding adequate antibody prevalence rates for herd immunity, but to achieve this, immunization procedural flaws and faulty records must be kept to very low levels. The greatest obstacle to worldwide control of measles is a failure of vaccination programs to produce adequate herd immunity levels in less-developed countries **[5, 7, 10]**. Therefore, vaccine must be given promptly after passive immunity wanes, because the level of endemicity is so high **[2]**. It is difficult to determine just what age is optimal, because it varies from one country to another. Premature vaccination not only fails to immunize, but also interferes with subsequent re-immunization **[11]**. These differences are important in comparisons of South Asian countries with others, but not elsewhere. Differences in efficiency of transport of antibody across the placenta also play a role, but usually a minor one. Most important seems to be variation in antibody durability in the infant. Where families are poor, the children acquire many infections at an early age, and passively acquired antibody is swept out. To provide protection for them, the vaccine must be given at a carefully determined age, specific for each community. Only when this is done can we hope to reduce measles worldwide to a sufficiently low level that it will be removed as a threat to persons in the United States, or anywhere else **[8, 11]**. In the Republic of the Marshall Islands (RMI), no measles cases were reported during 1989–2002; however, a large measles outbreak occurred in 2003 **[5]**.

In 1998, the WHO European Region targeted elimination of measles by 2007 through vaccination programs. Vaccine coverage in excess of 95% interrupts endemic transmission of measles **[1, 2]**. However, recent data suggest that routine measles vaccination coverage has declined in some regions, and as a consequence an increase in outbreaks number and size is observed **[7]**.

To obtain sero-epidemiological profile and develop optimal strategies to promote measles elimination, Chuanxi Fu et.al. conducted measles seroprevalence study using stratified sampling method in Guangzhou, southern China in 2008. 4036 samples were analyzed by the enzyme-

linked immunosorbent assay method and the overall sero-positive rate of measles antibody was 70.6% (95% CI 69.2–72.0%) **[6]**. This result nearly equal to what is found in the current study.

Past measles immunization policies in Australia have resulted in a cohort of young adults who have been inadequately vaccinated, but who also have low levels of naturally acquired immunity because immunization programs have decreased the circulation of wild virus **[5]**. Nation-wide epidemiological investigations to the outbreak was restricted to Southeastern France, most likely reflected the endemic circulation of measles virus due low vaccination coverage **[7]**.

A measles-mumps-rubella (MMR) immunization campaign aimed at addressing this susceptibility to measles among young adults was conducted in Australia in 2001–2, Heath *et al*., concluded that the young adult MMR program appears to have had no effect on residual susceptibility to measles among the 1968–82 birth cohort. Young adults in Victoria, as in other countries where past immunization policies have left a residual susceptible cohort, represent a potential problem for the maintenance of measles elimination **[9, 12]**. The researchers stated that among young adults, 5% to 20% are susceptible to rubella and measles, and outbreaks occur where these persons congregate. Most adults are not immunized, despite recommendations for vaccines against these diseases **[8, 9]**. Peter *et al.* recommend MMR vaccination of all health care workers who lack immunity to measles to prevent nosocomial transmission of measles, although the primary emphasis is on health care workers in hospitals, those at other sites, such as clinics, nursing homes, and schools, are also included Vigorous efforts are needed to implement strategies to reduce disease incidence, morbidity, and death among adults **[10, 12]**.

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Table 1: Distribution of the Observed Frequencies, Percent, and Summary Statistics of some Characteristics Variables of the Study Sample

Parameters	Groups	No.	Percent
Age (year)	19	9	5.8
	20	23	14.8
	21	30	19.4
	22	28	17.4
	23	26	16.8
	24	29	18.7
	25	11	7.1
Total		156	100
Mean ± SD		22.11 ± 1.64	
Gender	Male	58	36.8
	Female	98	63.2
Total		156	100
BMI	Under weight(<18.5)	23	14.2
	Normal weight (18.5-<25)	78	50.3
	Over weight(25-30)	39	25.2
	Obese(>30)	16	10.3
Total		156	100
Mean ± SD		23.29 ± 2.77	

Table 2: Estimation of Measles Immunity Amongst Young Adults in Diyala

Measles vaccine	Birth cohort	Age /Year 2011	No.	Percent immunity	Male %	Female %
MMR licensed 1988	1988 - 1993	18-25	156	67.1	40.7	59.3

Table 3: Distribution of Immunity to Measles Among Healthy Medical Students

Situation of immunity	Number	%
Low positive	58	37.4%
Positive	38	24.5%
Strong positive	9	5.8%
Negative	52	32.9%
Total	156	100%

Table 4: Summary Statistics With Comparison Significant of Measles IgG Titer Before and After Vaccination

Titer	Mean	No.	Std. Deviation	Std. Error Mean	Person's Correlation Coefficient	Paired Samples Test	P-value
Before	0.294	104	0.22	0.04	0.807; P=0.000 HS	-5.270	0.000 HS
After	0.449	104	0.25	0.05			

NOTE: HS: Highly Sig. at P<0.01

Table 5: Distribution of the Observed Frequencies and Their Percent of the Studied Parameters

Parameters	Levels	Frequency	Percent
Measles vaccine	Unknown	60	39.6
	Vaccine +	96	60.4
MMR vaccine	No Vaccine	4	2.5
	Unknown	64	42.1
	Vaccine +	88	55.3
Measles Infection	No Vaccine	51	32.1
	Unknown	98	64.2
	Infection	6	3.8
	Total	156	100

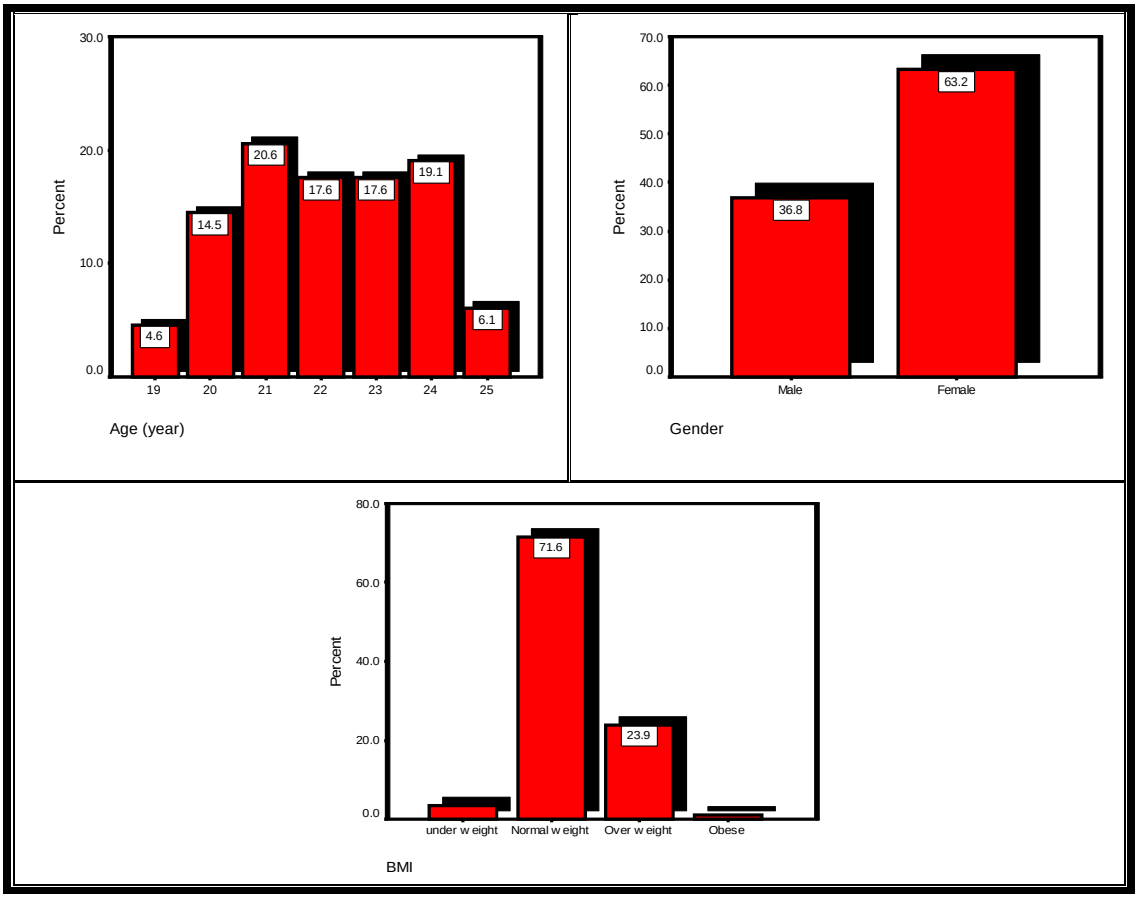

Figure 1: Bar Charts of the Frequency's Percents of Some Characteristics Variables of the Study Sample