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Immunosorbent survey and demographic features analysis of rubella virus infection among IDPS pregnant women of NWA Agency, KPK, Pakistan

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Abstract

The present study was conducted to find out the prevalence of rubella virus infection among pregnant women of IDPs (internal displaced persons) of NWA agency in Baka Khil camp KPK, Pakistan from February 2015 to July 2015. Two hundred fifty (250) blood samples were randomly collected from IDPs pregnant women. Sera were separated and screening was with Enzyme linked immunosorbent assay (ELISA). At overall 19.6% (49/250) and 3.6% (9/50) were positive against rubella specific IgG and IgM antibodies respectively. A higher prevalence was found in women of 32-39 years age group. 3rd trimester and house wife showed a high positivity rate (IgG=22.10%, IgM=5.26%) and (IgG=22.14%, IgM=5%) respectively. Also illiterate and women of low income status were at high risk of infection. The high prevalence of rubella infection during pregnancy can lead fetus at high risk of congenital rubella syndrome (CRS). So it is advisable to health planners to avoid further incidence of rubella infection by the immunization of childbearing age women.

Keywords: Rubella virus, IDPs, ELISA, NWA, IgG

1. Introduction

One of the infectious diseases among children and infants is the rubella virus infection [1]. Rubella infection is asymptomatic in most patients and get well without any sequelae or complications. But when the infection occurred in the early phase of pregnancy (especially in the first trimester) in pregnant women having no immunity against rubella virus, may cause abortion, stillbirth, fetal death or congenital rubella syndrome (CRS) [2]. In United State and some other countries of Europe, the indigenous circulation of rubella has been broken up and congenital rubella syndrome has been abolished. This success of CRS elimination largely depends on a vaccination program with effective surveillance [1, 2].

In 1979, RA27/3 vaccine for rubella infection in the USA was first licensed and is the only vaccine available yet [3]. Vaccination produces more than 98% of IgG antibodies in vaccine recipients and can produce sufficient amounts of immunity against asymptomatic and clinical infections [3, 4].

Laboratory test used to diagnose rubella infection includes hem agglutination inhibition, latex agglutination, neutralization test, polymerase chain reaction and enzyme linked immunosorbent assay (ELISA) [5]. ELISA is the most common diagnostic test for detection of rubella specific IgG and IgM antibodies against rubella virus infection [5, 6].

After the operation ZAR-E-AZB started on Sunday 15th June 2014 in North Waziristan Agency (NWA), a second largest agency of Federally Administered Tribal Areas (FATA), Pakistan [7]. Then the lives of peoples were adversely affected due to bombings, Airstrikes and severe fire exchanged by Pakistan army. In this condition the peoples of this area flee mostly to the district Bannu and other near areas (Afghanistan, Karak, Lakki Marwat, D.I. Khan). As there is no effective treatment for rubella, but is a vaccine preventable disease and the situation of vaccination among the people of NWA agency was so poor mainly due to terrorism and cultural issues [7-8].

In the light of these circumstances, the present study was aimed to find out the prevalence of rubella virus infection among pregnant women of IDPs (internal displaced persons) of NWA agency.

2. Materials and Methods

Study population

The present study was conducted among pregnant women of NWA agency, in IDPs camp set up in Baka khel near Bannu district, made by the Government of Pakistan authority. These women come from far away areas of NWA agency and reside in Baka khel camp closely to each other. Free movement and migration of people occurred in camp. Sharing many things of daily life and also has joint families. All these factors were added to facilitate the transmission of rubella virus among pregnant women.

Sample collection and laboratory analysis

250 blood samples were randomly collected from IDPs pregnant women in span of six months from February 2015 to July 2015 in sterilized vacuoliner. Written consent to participate in the study was obtained and complete record was compiled on specific questionnaire of each woman regarding their marital status, educational, income, stage of pregnancy, occupation and history of previous exanthematous infections with the assistance of well experienced assistants. Sera sample was obtained and were tested for rubella-specific immunoglobulin M (IgM) and immunoglobulin G (IgG) antibodies through ELISA (enzyme linked immunosorbent assay) technique using Cenix Diagnostic kit made in Dresden, Germany [5].

Ethical approval

The study protocol was approved by ethics review board of Kohat University of Science and Technology Kohat. Written consent was obtained from each woman after explaining the objective of the study prior to her enrolment.

Statistical analysis

SPSS statistical software version 17 was used for data analysis. The chi-square test was used to determine the significant association between two variables. One-way ANOVA test was used for the comparison of three and more

than three variables. P value was calculated, where 0.05 was considered significant at the 95% CI (Confidence Interval) level.

3. Results

The present study comprised of 250 pregnant women of NWA agency and was analyzed for both IgG and IgM to find out the sero-prevalence ratio of rubella virus infection. The results showed the sero-positivity rates of rubella virus infection among pregnant women in relation to their demographic features having mean age 26.22 years with standard deviation (STD) ± 6.84 (Table 1). Out of total, 19.6% (49/250) was positive for rubella specific IgG antibodies and 3.6% (9/250) for IgM. To know the relationship of rubella virus infection to age group the women were categorized into three age groups. Among the age groups highest average positivity rate was found for the age group of 32-39 years (IgG=23.71% and IgM=4%) than the other two groups. Age of the respondents assumed statistically significant relation with infection as $P < 0.05$. Awareness about diseases was a key to avoiding various transmission routes/factor which yields in lower prevalence of diseases and education has positive contribution regarding awareness of such diseases. In this respect women of the present study were divided into three groups namely illiterate, matriculate and graduate. It was found that illiterate women more positive to rubella virus infection than educated like matriculate and graduate women. A higher prevalence of rubella specific IgG and IgM antibodies was found in house wife followed by farmer and employed women, and was statistically significant as $P = 0.0473$. Women of low economic position showed high positivity (IgG=30%, and IgM=7%) than women of medium (IgG=14%, IgM=0%) and high economic position (IgG=5%, IgM=2%). In present study it was observed that women in third trimester was at risk of rubella virus infection (IgG=22.10% and IgM=5.26%) as compare to second and first trimester shown in Table 1&2.

Table 1: Prevalence of rubella virus infection among pregnant women according to socio-demographic features.

Demographic Characteristics	Total numbers analyzed	IgG		IgM		Pvalue
		Positive	+ve%	Positive	+ve%	
Age (years)						
16-23	60	9	15	0	0	0.0004*
24-31	103	17	16.50	5	4.85	
32-39	97	23	23.71	4	4.12	
Education						
Illiterate	117	27	23.07	5	4.27	0.0027*
Matric	73	13	17.80	3	4.10	
Graduate	60	9	15	1	1.66	
Occupation						
Farming	67	13	19.40	0	0.00	0.0473*
Employed	43	5	11.62	2	4.65	
House wife	140	31	22.14	7	5.00	
Stage of pregnancy						
1 st trimester	73	11	15.06	3	4.10	0.0001*
2 nd trimester	83	17	20.48	1	1.20	
3 rd trimester	95	21	22.10	5	5.26	
Economic position						
High	45	5	11.11	2	4.44	0.0090*
Medium	88	14	15.90	0	0.00	
Low	117	30	25.64	7	5.98	

*One way ANOVA, **Chi-square test

The rubella virus infection was found nearly in all categories of clinical features and symptoms, however highest ratio was

determined among pregnant women having rashes (IgG=47.94%, IgM=5.47%). However a slight variation was

found among the other symptoms. A significant relation was found of rubella virus infection to various sign and symptoms

($P=0.0009$).

Table 2: Prevalence of rubella virus infection among pregnant women according to clinical features.

Clinical Symptoms	Total numbers analyzed	IgG		IgM		Pvalue
		Positive	+ve%	Positive	+ve%	
Headache	99	13	13.13	2	2.02	0.0009*
Rash	73	35	47.94	4	5.47	
Fever	117	19	16.23	3	2.56	
Arthralgia	49	7	14.28	2	4.08	
Joint pain	23	3	13.04	0	0.00	

* One way ANOVA test

4. Discussion

Rubella virus infects population throughout the entire globe having no age and sex limit [8]. It can cause self-limiting disease known as rubella normally, however disastrous during pregnancy and may affect all organs of the developing fetus of the susceptible pregnant women especially in the first trimester of pregnancy. This situation called congenital rubella syndromes (CRS) and has very high estimated lifetime expenditure for both parents and governments [9].

The present study results suggests that the overall inclination rate of rubella virus infection among IDPs women of childbearing age was 19.6% (49/250) and 3.6% (9/250) at rubella specific IgG and IgM antibodies respectively. However this positivity rate is much lower than the other study conducted in Lahore Pakistan, where 77.3% women were sero-positive against rubella specific IgG antibodies [7]. The prevalence rate of rubella virus infection in countries that neighbors Pakistan like India was 87.2% for IgG and 0.98% for IgM in New Delhi [8], and in Bangladesh it was 84.33% for IgG and 0.75% for IgM [9]. Beside this in Zaria, Nigeria prevalence rate of infection among pregnant women was 93.1% for IgG and 38.8% for IgM [10]. Deviations of the current study from the other previous studies may be due to different sample population, climate, vaccination and geographic conditions.

The present study also analyzed rubella virus positivity rate with various parameters of the study participants like age, economic position, residential area and pregnancy stage. When sorted by age then it was found that women in age group of 32-39 years showed high positivity rate (IgG=23.71% and IgM=4.12%) than the other two age groups. It means that rubella virus infection has direct impact with age, when age increases positivity rate also increases [9, 11]. Berno M *et al.* and Eleazu CO *et al.* also suggested that when age increases rubella infection rate also increase [12, 13]. This may be due to the fact that when age increases, immunity level of women decreases triggering the rubella infection.

Education has inverse relation with rubella virus infection. The present study indicated that illiterate women has high positivity infection rate of rubella virus infection than education women [13]. This may be as educated women have more knowledge and awareness about control and preventive measurement of such disease than illiterate women.

In present study, it was found that housewives were at high risk of contracting rubella virus infection, as house wife showed high positivity rate for rubella virus at both IgG and IGM (IgG=31% and IgM=7%) antibodies respectively than farmer (IgG=19.40% and IgM=0%) and employed women (IgG=5% and IgM=2%). As house wife may face more kids and poor hygienic condition which facilitate the rubella virus infections and its transmission [13].

In the current study, as in a Tanzania one [12], it was noted that

pregnant women having high economic position were associated with low risk to acquire rubella virus infection than medium and low economic status women. As high economic position may implies good living condition [14].

A meaningful difference was found between the trimesters of pregnancy for the rubella virus infection. It was found that women of third trimester showed higher prevalence rate 22.10% and 5.26% against IgG and IgM antibodies respectively as compared to first and third trimester of pregnancy. Similar finding was also addressed by Berno *et al* [12]. This may be to the fact as majority of female started caring in the last stage of the pregnancy as disease could not be detected earlier. Some feasible clinical features were observed in pregnant women including headache, fever, rash, Arthralgia and joint pains. Among these, women presenting rash and fever has higher prevalence rate for the rubella infection. but generally clinical manifestations has no major role in rubella infection as infections like measles, human parvovirus, scarlet fever and toxic drugs also presents clinical manifestations like rubella. So they indicated that clinical symptoms have no confirmation of rubella virus infection [15].

5. Conclusion

From the above results it may be concluded that in agency area there may be high risk factor of rubella virus. The high prevalence of rubella infection during pregnancy can lead fetus at high risk of congenital rubella syndrome (CRS). Education and high economic position play a key role in reduction rubella virus infection. So it is advisable to health planners to avoid further incidence of rubella infection by the immunization of childbearing age women.

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