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Original Research Article

Rubella Virus Antibodies Serosurvey among Students Attending Federal Polytechnic Nasarawa, between 2022 and 2024

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Abstract: Rubella Virus antibodies serosurvey among students attending the Federal Polytechnic, Nasarawa, Nasarawa State. Rubella rapid test kits were employed for this research, while questionnaires were distributed to obtain the demographic factors of respondents. Respondent's samples were obtained via questionnaires using the random sampling method. For the year 2022, one hundred and eighty (180) blood samples collected by finger puncture, five (5) which is 2.77% was the overall prevalence of Rubella Virus antibody; while out of one hundred and eighty (180) students blood samples analysed in 2023, fifty-four (54) tested positive with an overall rubella antibody prevalence of 30%; in the year, 2024, one hundred and fifty samples analysed gave two (2) positives resulting 1.33 % rubella antibody prevalence. The highest prevalence of 4.29% was recorded among the 19-22 years old group in 2022, while the highest prevalence in the 2023 study was 36.5% among the 19-22 years old age group, the 2024 study had a prevalence of 3.30% among 23-26 years old age group. The rubella virus antibody prevalence in relation the level of educations had a prevalence of 41.5% among ND II students in 2022; the prevalence of 6.90% was recorded among the ND I students in 2023; while a prevalence 3.63 % was recorded among HND II students in 2024. The prevalence of rubella virus antibody was 18.1% among Males and 35.0% among females in 2022, the prevalence of 4.29% for male and for female 1.82% in 2023.

Keywords: Distribution, Rubella, Antibody Prevalence, Students, Rapid test kits, Nigeria.

INTRODUCTION

Rubella, also known as German measles or three-day measles, (Neighbors and Tannehill-Jones, 2010) is an infection caused by the rubella virus (Lambert *et al*., 2015). This disease is often mild, with half of people not realizing that they are infected (Atkinson, 2015; WHO,2015). A rash may start around two weeks after exposure and last for three days (Atkinson, 2015). It usually starts on the face and spreads to the rest of the body (Atkinson, 2015). The rash is sometimes itchy and is not as bright as that of measles (Atkinson, 2015). Swollen lymph nodes are common and may last a few weeks (Atkinson, 2015). A fever, sore throat, and fatigue may also occur (Atkinson, 2015; McLean, 2014). Joint pain is common in adults (Atkinson, 2015). Complications may include bleeding problems, testicular swelling, encephalitis, and inflammation of nerves (Atkinson, 2015). Infection during early pregnancy may result in a miscarriage or a child born with congenital rubella syndrome (CRS) (Lambert *et al*., 2015) Symptoms of CRS manifest as problems with the eyes such as cataracts, deafness, as well as affecting the heart and brain (Lambert *et al*., 2015).

The causative agent of congenital rubella syndrome is found in the genus *Rubivirus* and the *Togaviridae*. The virus is mainly transmitted from human to human by direct contact with infected bodily fluids or respiratory droplet secretions from infected people, usually characterized by a mild febrile rash illness (Atkinson, 2015). With the lack of protective antibodies, rubella infection during the first trimester is associated with congenital defects, known as congenital rubella syndrome (CRS), affecting all organs in the developing fetus and causing miscarriage and fetal death (McLean, 2014). Although rubella and CRS are not included in the surveillance system in Morocco, a retrospective assessment of the CRS burden in the country estimated its incidence at 8.1–12.7 cases per 100 000 live births (Lambert *et al*., 2015). Rubella remains endemic in many other countries especially in sub-Saharan Africa (Patel *et al*., 2020; Perry *et al.,* 2014). Unfortunately, none of these regions have any clear or

specific goals to overcome the rubella outbreaks (WHO, 2023). The prevalence of Rubella infection in children is equal in both sexes whereas it affects more adult females than males (Leung *et al*., 2019). Risk factors for Rubella infection include partially or unvaccinated individual, travel to endemic areas, exposure to household members with Rubella and immunodeficiency (Leung *et al*., 2019). About 25% - 50% of those exposed with acquired rubella infection may be asymptomatic or subclinical, especially in children (Tushabe *et al*., 2020). There is a prodromal period of one to five days after the infection and is represented by a low-grade fever, nausea, anorexia, lethargy, coryza, cough, headache, non-exudative conjunctivitis, malaise, lymphadenopathy and an upper respiratory infection (Tushabe *et al*., 2020). Laboratory confirmation of rubella virus infection can be based on a positive serological test for rubella-specific immunoglobulin M antibody, a four-fold or greater increase in rubella-specific immunoglobulin G titres between acute and convalescent sera or detection of rubella virus RNA by reverse transcriptase-polymerase chain reaction and also viral culture from body fluids (Leung *et al*., 2019).

METHODS

This research was conducted in Applied Biology-Microbiology Department, Federal Polytechnic, Nasarawa. Nasarawa State -Nigeria. Respondents for this study were randomly selected from the male and female population of students who volunteered to participate in this study. Those having underlying conditions such as hepatitis Band C viruses, Human Immunodeficiency Viruses sociodemographic variables include gender, age, and educational level. Rubella virus antibody was analysed using Rubella Rapid Test Kits. Blood samples were obtained from each respondent through needle puncture of their thumb after sterilizing it cotton wool soaked in methylated spirit, drops of blood was applied to the pouch of the rapid test kits as directed by the manufacturers. The whole blood sample was collected with a sterile capillary tube according to the manufacturer's instruction. The pouch at the notch was opened and the kit was removed and placed on a clean, flat laboratory table and labelled appropriately. A drop of whole blood was applied into pouch and two buffer solution drops were dropped into the well and allow to mix for 10-15 minutes. After this short period of time, the test was observed and the result taken. All the data were collated and entered into a database design using MS excel spreadsheet and in order to process the statistical variables which may be significant to the research.

RESULTS

Table 1: Sociodemographic Factor: Age-Group and Rubella Virus Antibodies 2022 to 2024

Characteristics	Number Sampled	Number Positive	% Positive	Chi-Square (x^2)	P-Value
2022					
Age-Strata					
14-18	10	03	30.00	4.005	0.405
19-23	74	27	36.50		
24-28	77	21	27.30		
29-33	19	03	15.79		
TOTAL	**180**	**54**	**30.00**		
2023					
Age-Strata					
14-18	11	0	0.00	3.454	0.485
19-23	70	3	4.29		
24-28	85	2	2.35		
29-33	37	0	0.00		
TOTAL	**180**	**5**	**2.78**		
2024					
Age-Strata					
14-18	39	00	0.00	3.172	0.366
19-23	30	00	0.00		
24-28	61	02	3.30		
29-33	20	00	0.00		
TOTAL	**150**	**02**	**1.33**		

Table 2: Sociodemographic Factor: Educational Level in relation Rubella Virus Antibodies 2022 to 2024

Characteristics	Number Sampled	Number Positive	% Positive	Chi-Square (x^2)	P-Value
2022					
Education level					
National Diploma I	34	10	29.40	5.217	0.157
National Diploma II	53	22	41.50		
Higher National Diploma I	48	12	25.00		
Higher National Diploma II	45	10	22.30		
TOTAL	**180**	**54**	**30.00**		

Characteristics	Number Sampled	Number Positive	% Positive	Chi-Square (x^2)	P-Value
2023					
Education level					
National Diploma I	29	02	6.90	1.775	0.620
National Diploma II	64	01	1.56		
Higher National Diploma I	69	02	2.90		
Higher National Diploma II	18	00	0.00		
TOTAL	**180**	**05**	**2.78**		
2024 Study					
Education level					
National Diploma I	82	00	0.00	3.387	0.147
National Diploma II	13	00	0.00		
Higher National Diploma II	55	02	3.63		
TOTAL	**150**	**02**	**1.33**		

Table 3: Sociodemographic Factor: Gender in relation Rubella Virus Antibodies 2022 to 2024

Characteristics	Number Sampled	Number Positive	% Positive	Chi-Square (x^2)	P-Value
2022 Study					
Gender					
Male	72	13	1810	8.153	0.004
Female	108	41	35.00		
TOTAL	**180**	**54**	**30.00**		
2023 Study					
Gender					
Male	70	03	4.29	0.814	0.367
Female	110	02	1.82		
TOTAL	**180**	**05**	**2.78**		

DISCUSSION

This research unravelled prevalences of *Rubellavirus* antibodies within the students of this institution to assess the incidence and prevalence in order to make an informed highlight on the need to advise the state ministry of health to clamour for the importance of carrying a state wide research to ascertain the true outlook or trend of this virus in nooks and crannies of Nasarawa State.This research revealed 2.77% , 30%, and 1.33% as the overall Rubellavirus prevalences for 2022, 2023 and 2024 respectively. The overall prevalence of rubella virus antibodies in this research revealed lower prevalences when compared to studies carried out elsewhere. Studies among women of child bearing age in Nigeria put prevalence at 63.3% in Kaduna, 66.6% in Imo, 77% in Lagos and 93.5% in Oyo (Bukbuk *et al*.,2002; Eleazu *et al.,* 2007). Similar findings have been reported in Ibadan, Nigeria (68%) (Bamgboye *et al*., 2017), DRC (58.9%) (Zanga *et al*.,2017) and Sudan (65%) (Hamdan *et al*., 2011). However, higher prevalences were reported by previous studies in Ethiopia (89%) (Wondimeneh *et al*., 2018), Senegal (90.1%) (Dromingy *et al*., 2003), Namibia (85.0%) (Jones *et al*., 2016), Burkina Faso (95%) (Tahita *et al*., 2013) and Zimbabwe (92%) (Mamvura *et al*., 2015). The low prevalences recorded in this recorded in this study compared to higher prevalences in previous researches in prevalence with these might be attributed to difference and variables, while this research studied rubella antibody distribution and both male and female respondents' previous researches concentrated on pregnant women alone. While the subjects utilized in this report were solely un married students', previous studies were specifically carried out on married and pregnant women. Differences in prevalences could be found in the sample sizes, and disease endemicity. Seroprevalence of rubella antibodies in many countries have shown a comparable prevalence among women of childbearing age; for example, 89.4 % in parts of Nigeria (Adewumi *et al*., 2015), 88.1 % in Cameroon (Fokunang *et al*., 2010) and 84 % in the Democratic Republic of the Congo (Alleman *et al*., 2016). However, the rubella seroprevalence found in other studies is high with the 93.3% seroprevalence in pregnant women in Portugal (Lito *et al*., 2013), the 94.4% seroprevalence in pregnant women in Norway (Barlinn *et al*., 2014) and 95.3% seroprevalence in women of childbearing age in South Africa (Corcoran and Hardie, 2005).

The level of natural immunity in these studies is lower than the immunity currently reported in Europe; this might be due to on-going vaccination programmes in developed countries (Pebody *et al*., 2000). Worldwide, over 100 000 babies are born with CRS each year (WHO,2011; Binnicker *et al*., 2010). As a matter of fact, in many developing countries, rubella sero-positivity among pregnant women has been reported to range from 54.1% to 95.2% (WHO,2011; Uyar *et al*., 2008). A systematic search of original literatures from different African countries, the natural immunity of rubella was found to range from 52.9 to 97.9 % between 2002 and 2014 (Mirambo *et al*., 2015). However, data obtained from some countries, rubella seropositivity seems to increase with age (Alvarado-Esquivel *et al*., 2016).

CONCLUSION

Rates of rubella virus immunity is very low among the studied population of students in the Federal Polytechnic Nasarawa a very low prevalences of 30.00 %, 2.78 %, and 1.33% in 2022, 2023. and 2024 respectively suggesting a very low rate of infection among respondents of this institution. This research indicated the lack of outbreaks and possibly non-existence of reinfection among the volunteer's rubella researches should be analysed with a degree of reservation because Rubella virus prevalence did not show a degree of remarkable differences among the sexes, age-groups and educational level.in the three successive years studied. There is a very pertinent need to carry out a rubella study among the pregnant women within the institution and the community to realise the trend of this pathogen within this study area.

Author's Contribution

Conceptualization: H. Y. and M. E. S.
Methodology: A. A and A. A. J
Formal Analysis: Y. J. and A. A. J.
Writing – Original Draft: H. Y.
Writing – Review & Editing: H. Y., M. E. S, and A. A.

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