Int.J.Curr.Microbiol.App.Sci (2019) *8*(6): 960-967

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 8 Number 06 (2019)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2019.806.116

Seroprevalence of Measles Antibodies among Young Adults in a Tertiary Care Hospital, India

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Keywords

Measles, Antibodies, Adults, IgG ELISA Kit

Article Info

Accepted:
10 May 2019
Available Online:
10 June 2019

A B S T R A C T

Measles is a highly contagious vaccine-preventable disease caused by the Morbilivirus. Measles vaccine was introduced in India in 1985 as a part of Universal Immunization Programme (UIP) which was given at 9 completed months of age. As vaccine coverage has increased, there has been a marked reduction in measles incidence in the pediatric age group; but at the same time, the average age, at which measles infection occurs, has significantly increased. Many countries have reported diminishing of antibody titres against measles among young population as immunization coverage of adolescents and adults in not monitored. Objective is to determine seroprevalence of IgG antibodies titres against measles in young adults. It is a cross sectional study, conducted over 6 months (JUNE to NOVEMBER 2018) Sample size is 200. Study population belonged to 15-30 yrs of age. Samples – serum (Blood) Measles IgG ELISA Kit (EUROIMMUN). Out of the 200 samples collected, 65.6% had protective titres, 21.9% of the study group showed susceptibility i.e. they had unprotective levels of antibody titres and 12.5% were in the borderline titre group. Most of the individuals were vaccinated with a single dose of measles vaccine. Several reports have shown that the susceptibility to measles infection may be rising because of waning vaccine induced immunity over time after vaccination, in the absence of natural boosting by circulating measles viruses While most of the immunization drives in developing countries are aimed at children, it is important to recognize and identify pockets of susceptible populations that could jeopardize the prevention and control of these vaccine preventable diseases. Hence there is a need for serosurveillance and mop -up programs to cover these pockets of susceptible population so as to reach the WHO goal of Measles Eradication by 2020.

Introduction

Measles is a highly contagious vaccine-preventable disease caused by the Morbilivirus. It is a single-stranded, negative-sense, enveloped RNA, which belongs to the family Paramyxoviridae. Measles is characterized by the presence of fever, cough, and coryza, followed by the appearance of a typical rash (9).

Measles vaccine was introduced in India in 1985 as a part of Universal Immunization Programme (UIP) which was given at 9

completed months of age. Two-dose vaccination strategy was introduced in India in 2010 (19)

As vaccine coverage has increased, there has been a marked reduction in measles incidence in the pediatric age group; but at the same time, the average age, at which measles infection occurs, has significantly increased (10)

In spite of the availability of vaccine, more than 20 million measles cases are reported every year all over the globe. In 2010, alone 139,300 deaths due to measles were reported underlining the public health importance of this infection (13).

Although most reported measles cases are still in young and school-aged children, recent cases and outbreaks have also occurred in isolated communities of adults. Approximately 25% of the cases reported in 2008 were in people age 20 and older.

Study findings have indicated that more than 50% of the global measles associated deaths were reported in India alone (19) Measles outbreaks among highly vaccinated populations have been observed in many countries (15,9,19) Recently, three outbreaks of measles in adults (medical cadets, medical students and nursing students) were reported from the State of Maharashtra, Karnataka and Andhra Pradesh. It is clear that Measles is a re-emerging disease.

Vaccine, the most important intervention in the transmission of measles, is failing to confer enough immunity to public and is evident by the fact that alarming number of cases in previously vaccinated subjects have been observed (11).

Many countries have reported diminishing of antibody titres against measles among young population as immunization coverage of adolescents and adults in not monitored.

These outbreaks of measles among young population emphasize the need for serosurveillance of susceptible population and strengthening of vaccine coverage. In view of the present scenario of measles in India, the aim of this study was to determine the susceptibility against measles among young adults.

Materials and Methods

Study area and population

The study population included young adults (15-30 yrs) and was carried out in Microbiology laboratory of Osmania General Hospital, a tertiary care teaching institute over a period of 6 months from July- December 2018.

Sample collection and size

5ml of whole blood sample was collected in a serum separator vacutainer under aseptic conditions from200 healthy individuals within the age group of 15-30 years. The serum was separated and stored at -2ºC.

Test Details

Detailed history of the individual was taken regarding immunization status. The presence of specific IgG antibodies against measles in the obtained sera samples was determined by the ELISA method. We used the commercial EUROIMMUN Measles Virus IgG KIT. The test was performed according to the instruction booklet of manufacturer.

Evaluation of results

The results were evaluated qualitatively as positive, negative and borderline. Positive

results were evaluated as corresponding to 200 IU/ml and over, negative under 200 IU/ml and borderline 201-275 IU/ml titres.

Results and Discussion

Out of 200 individuals who participated in the study, according to the vaccination history given 182 (91%) were vaccinated, 8 (4%) were not vaccinated and 10 (5%) of their vaccination status was unknown (Figure 1). Of the total samples obtained, all the individuals belonged to the age between 15-30 years. Individuals were categorized into 3 age groups, 30 of them belonged to 15-20 yrs (years of birth 1999-2004),100 belonged to 21-25yrs (years of birth 1994-1998), 62 belonged to 26-30 yrs (years of birth 1989-1993). Age wise distribution amongst these individuals showed most of them belonging to 21-26 years, followed by 26-30 years (Figure 2).

Vaccination against measles in India was introduced in 1985 in a one-dose schedule, which was changed to a two-dose schedule in 2010. It means all the study population of the 3 categories of age was vaccinated only with one dose of measles. In 200 serum samples obtained, 94 of them were males (47%) and 102(51%) were females. There was almost equal gender representation (Table 1).

Based on the commercial kit, titre value percentages of population having negative titre, positive titre and borderline titres were as follows (Figure 3). International value 200 IU/L is seen as a correlate of protection. 21.9% of population have negative titre values, 12.5%of population have borderline titres (12.5%) and 65.6% have protective titres (65.6%). The study also shows that most of the individuals having protective titres were in the age group of 15-20 years. Majority of the people in 21-26 years' age group had borderline titres. Almost all of them in the age group of 26-30 years had unprotective antibody titres (Figure 4 and 5).

Despite high measles vaccination coverage by a successful national vaccination program, many outbreaks have occurred among vaccinated young adults. (12) In the present study the recorded overall seropositivity of the specific IgG antibodies against measles as 65.6%, 21.9% of the tested samples were seronegative and 12.5% were borderline titres.

Similar susceptibility or seronegative titres was observed by Gomber *et al*., (21.4%) and Raut et al (19.2%). The lowest seropositivity i.e. unprotective titres of measles IgG antibodies in current study were detected in the age group of 26-30 years. This age group was formed by vaccinated persons, but they were given only one dose of vaccine during the first years of vaccination implementation into the Universal immunization program. This corresponds to the study findings of Trmal *et al.,* (18).

The second lowest seropositivity or borderline antibody titres was detected in the age group of 21-25 years. The highest seropositivity or protective levels of IgG antibodies was detected in the age group of 15-20 years.

Several reports have warned that the susceptibility to measles infection may be rising because of waning vaccine induced immunity over time after vaccination, in the absence of natural boosting by circulating measles viruses. (8). In fact, it has been shown that the levels of antibodies developed in response to the vaccine decline at a much faster rate than when naturally acquired (4b)Simultaneously, an increase of seronegative individuals among the vaccines from the time of introduction of measles vaccination can be observed in present study.

Table.1

AGE GROUP	MALES	FEMALES
15-20 YRS	16	18
21-25 YRS	40	60
26-30 YRS	38	24

Fig.1

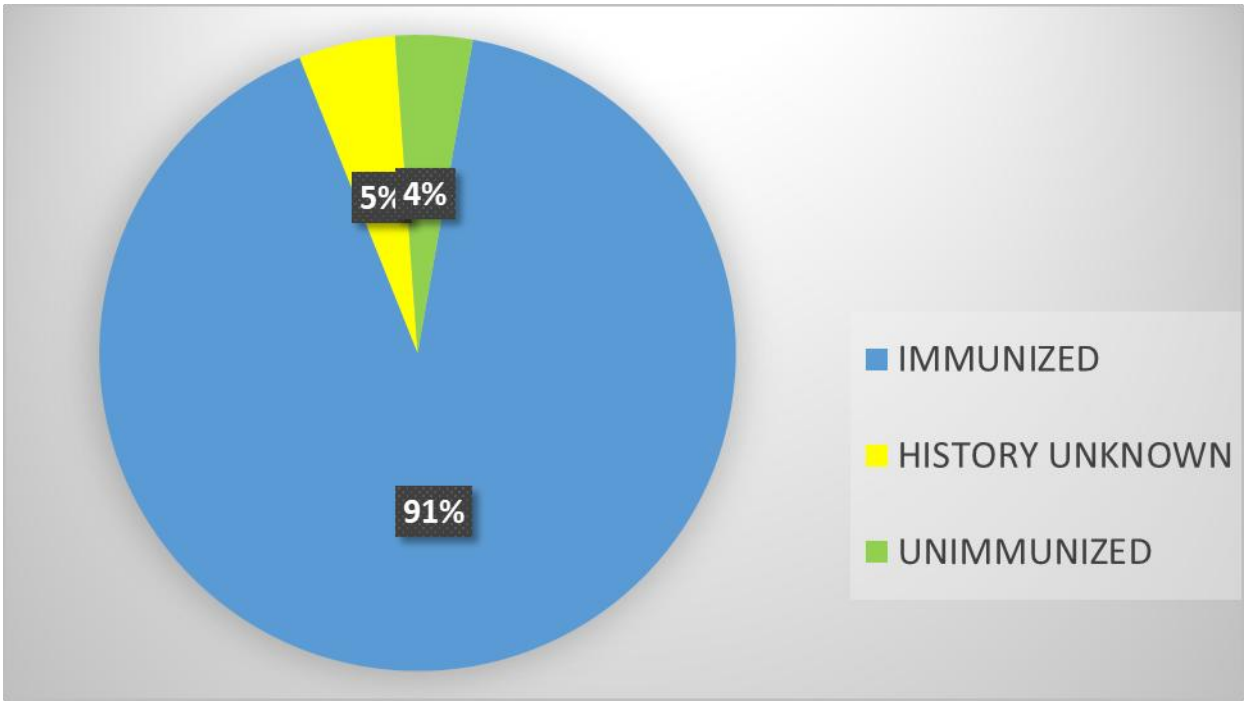


Fig.2

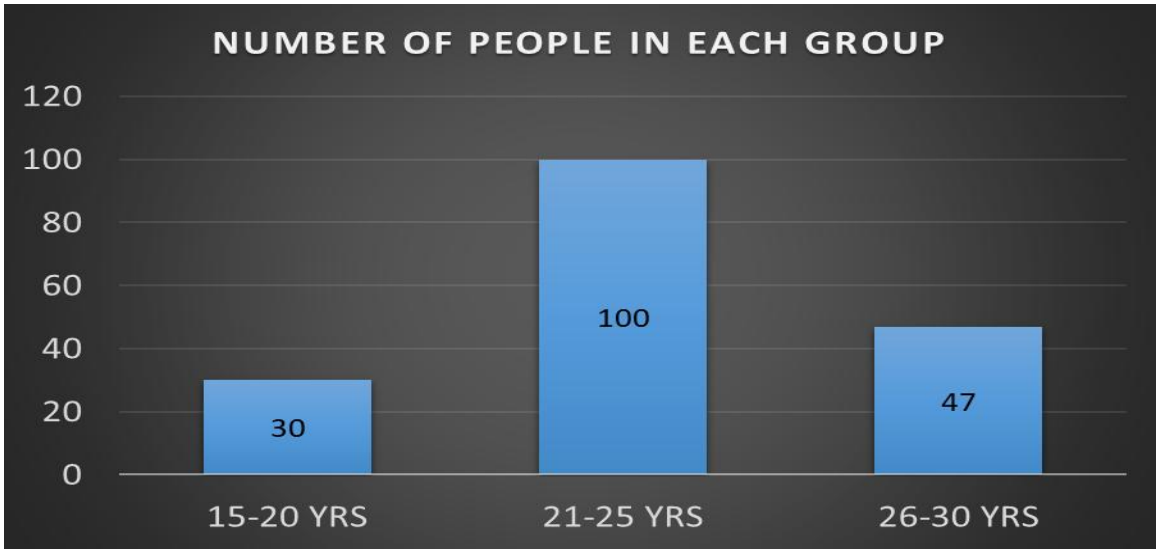


Fig.3

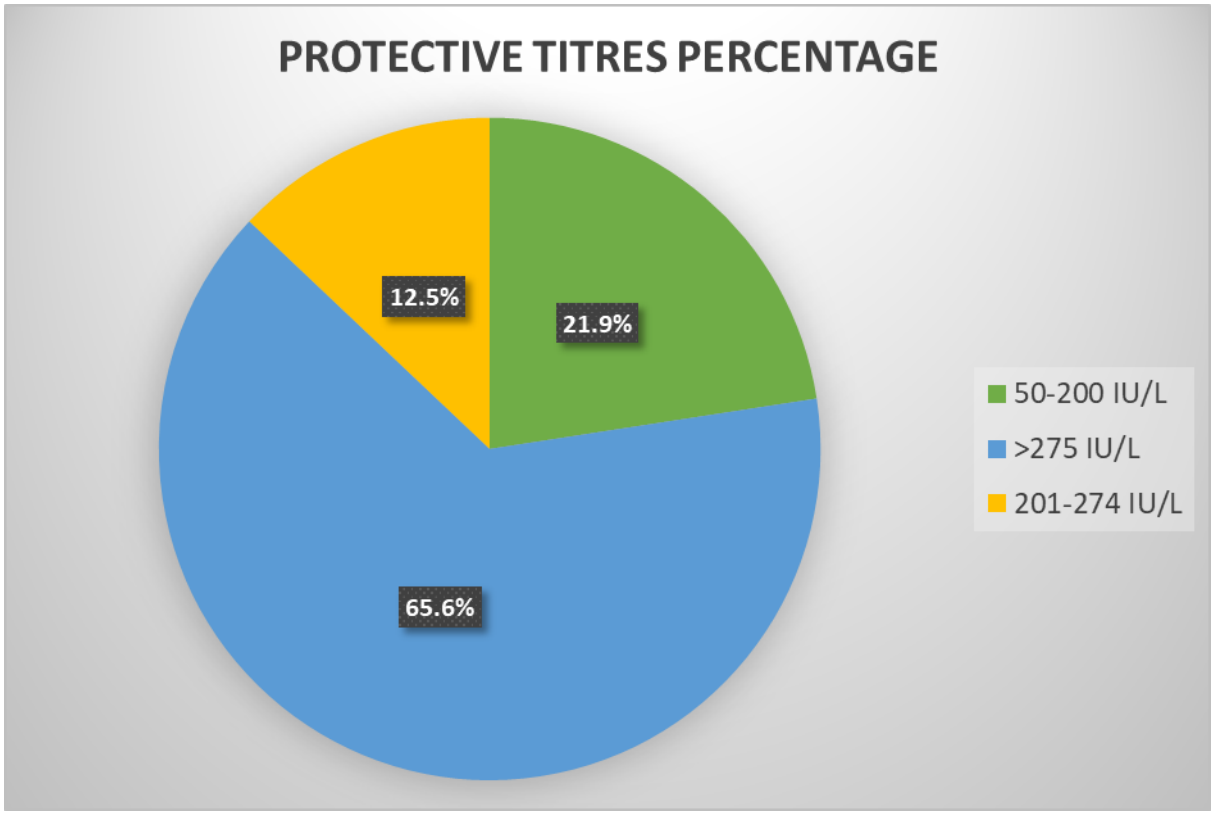


Fig.4

Age Wise Distribution

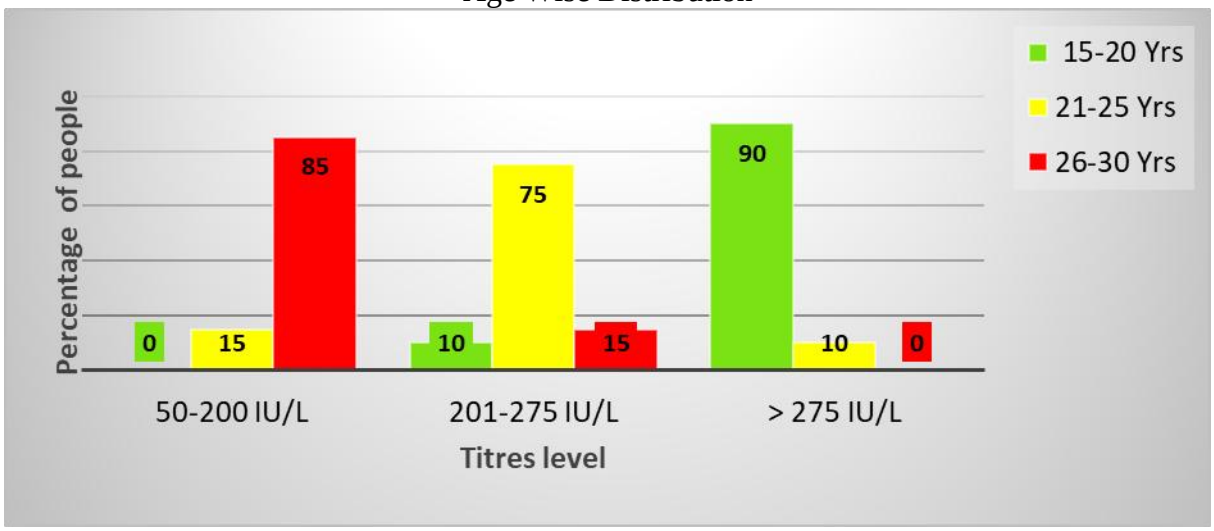
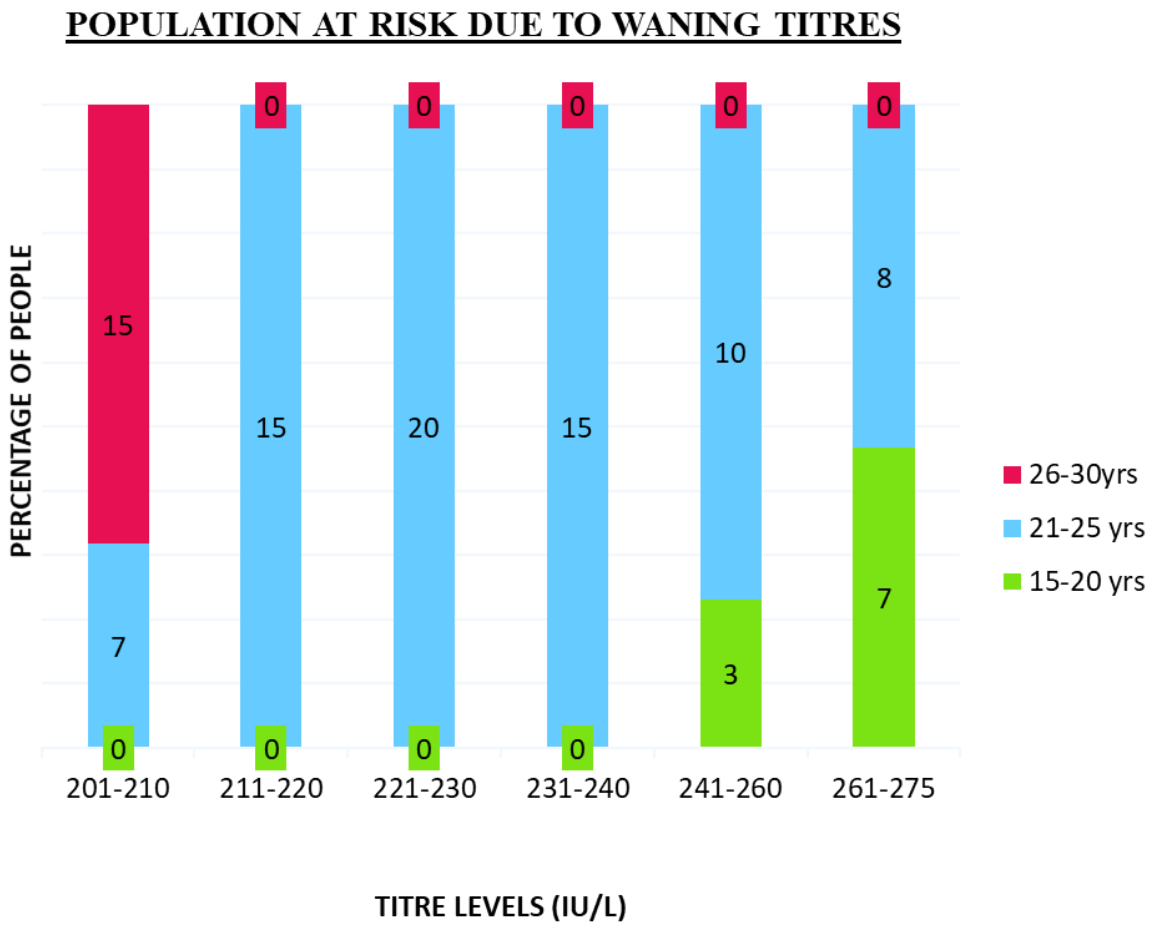


Fig.5



Such decreasing titres with increase in age could be due to the quality and handling of the vaccine used, the use of a one-dose vaccination schedule, primary or secondary vaccine failure and the waning immunity after vaccination.

Low levels of antibody concentrations in women of fertile age observed in the present study may also affect the quality of measles protection of unvaccinated newborns and infants. Infant protection is provided via transplacental transmission of antibodies in case that the mother has been vaccinated or had measles during life. From this point of view, it is possible to pose a question about the level of protection against measles in children of mothers, who have low seropositivity levels or low antibody concentrations in the serum (14).

All these findings suggest a possible gap in protection of population against measles. A possible confirmation of such is the measles outbreaks, which occurred in many regions of India recently among young adults (5).

The results of the present study have certain limitations as the study was conducted among urban educated youth, who may not be representative of rest of India.

In our study, a significant fraction of the participants with history of immunization

continue to remain susceptible. Identifying the susceptible population is an important step towards preventing and controlling outbreaks of measles. Eliminating these pockets of susceptible young adults would complement national efforts to control and eliminate measles in future.

Putting a step forward, the Government of India has initiated massive Measles-Rubella Vaccination Campaign in a phased manner in 2017, targeting children aged between 9 months and 15 years, with the aim to eliminate measles by 2020 (20).

Country specific data is needed to ascertain periodicity of such campaigns, which would be based on accumulation of susceptible individuals in a community.

In conclusion, serological monitoring of susceptibility to vaccine preventable diseases like Measles, Mumps and Rubella is an essential tool to monitor immune status in general population. Susceptibility of young adults to measles, as indicated by our study, reinforces the need for multicentric serosurveillance and booster vaccination against these vaccine preventable diseases.

Acknowledgement

We wish to express our deep sense of gratitude to the technical staff and faculty of Department of Microbiology, Osmania General Hospital for their valuable support and guidance to carry out this study.

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How to cite this article:

Prashanthi, L., N. Sridevi, Dara Saranya and Sashikala Reddy, P. 2019. Seroprevalence of Measles Antibodies among Young Adults in a Tertiary Care Hospital, India. *Int.J.Curr.Microbiol.App.Sci.* 8(06): 960-967. doi: https://doi.org/10.20546/ijcmas.2019.806.116