# Measles Immunity among Fertile Age Women in Kosovo

Ariana Kalaveshi[1,2], Teuta Osmani Vllasolli[3,4]*, Bernard Tahirbegolli[5], Leonora Alia Paice[6], Naser Ramadani[2]

1. Kosovo National Institute of Public Health.
2. University of Pristina, Faculty of Medicine, Department of Epidemiology.
3. University Clinical Center of Kosova Physical Medicine and Rehabilitation Clinic.
4. University of Pristina, Faculty of Medicine, Department of Physical Medicine and Rehabilitation.
5. Department of Management of Health Insitutions and Services, Heimerer College.
6. Department of Nursing, Heimerer College.

**Abstract**

The goal of this research was to examine the immunological status of women of fertile age in Kosovo and to evaluate the immune status of children under one year of age, based on the immune status of mothers.

Immunological status with regard to measles was initially investigated through samples of serum from 433 female partcipants of fertile age (15-49 years) from the Pristina, Prizren and Gjilan regions. In the second phase of the research, samples from 84 mothers, and their children below one year of age, were tested for inherited immunity to measles.

The mean age of female participants of fertile age was 29.11±7.91 years. 54.7% of them stated that they had been vaccinated with MMR and 29.6% had been infected with measles. The highest vaccination rate, at 91%, was among women aged between 15 and 19. The lowest immunity rate, at 79%, was found among women born between 1979 and 1983. In the analysis of 84 mothers and their children below one year of age, 42 mothers (50%) confirmed that they had been vaccinated, but their immunological status revealed that 71 mothers (84.5 %) had immunity ($p<0.05$).

Focusing on and targeting unvaccinated females (before they get pregnant) would ensure passive immunisation of their babies as a protective measure, until they reach the measles vaccination age.

**Clinical article (J Int Dent Med Res 2021; 14(1): 435-439)**

**Keywords:** Measles, Kosovo, Vaccination, Herd Immunity.

**Received date:** 06 October 2020 **Accept date:** 07 January 2021

## Introduction

Measles outbreaks are still part of the public health agenda. Despite WHO programmes and efforts to eradicate measles and rubella in five of the World Health Organization (WHO) regions by 2020, that has not yet been achieved.[1] The European Region has had a variety of problems which have caused measles outbreaks in recent years, including a fall in routine immunisation, lower coverage for certain vulnerable communities, and immunity gaps.[2] A decrease in immunity makes it easier for infected people to get infectious disease.[3] In 2019 alone, more than 13,000 cases of measles were identified in the 30 EU / EEA Member States, more than 10,000 of which were laboratory-confirmed.[4] During the 2000–2015 period alone, an estimated 20.3 million deaths have been prevented due to measles vaccination.[5]

Furthermore, gaps created by conflict in recent decades, especially in the countries of the former Yugoslavia, have led to persistent cases of measles in Europe. European countries also continue to report cases of measles which may result from contacts in Western Balkan countries.[6] Scandinavian nations, such as Sweden, record cases brought by asylum seekers from various countries, including the former Yugoslavia.[7] Population immunity of 92–95% is considered necessary to interrupt measles transmission.[8] Immunity to measels derives from two sources: active immunisation resulting from infection with wild or attenuated measels virus and passive imunization by tranplacentally acquired antibody.[9]

***Corresponding author:***
Teuta Osmani Vllasolli
Lagja e spitalit, PN, Klinika e Mjekësisë Fizikale dhe Rehabilitimit, 10000 Prishtinë, Kosovo.
E-mail: teuta.osmani@uni-pr.edu; tuti_o@yahoo.co.uk

In Kosovo, 610 infected children died as a result of complications during the measles outbreak of the 1960s and 1970s, of which 426 died before the vaccination period (1960-1970) and 184 died after the vaccination period (1971-1981).[10] Kosovo is not in a good position to respond to cases of measles, despite the fact that it has implemented a programme for the elimination of measles and congenital rubella control for the past two decades. Herd immunity was considered established in various population groups, because vaccination coverage was at 95% in Kosovo after the 1999 war, but this was not the case for MMR1 which was at a lower rate of about 80.5%.[11] A study of cases of measles for the period 2017-2018 by ethnicity found that 263 out of 711 (37.1%) of positive cases occurred in the Roma, Ashkali and Egyptian (RAE) community, and 399 out of 711 (56.1%) occurred in other communities living in Kosovo. For 49 (6.9%) of the patients covered by the study, ethnicity was not identified.[12]

In terms of screening activities for the detection of measles immunity, serological surveillance of the population plays a significant role.[13] To the best of our knowledge, no research has so far been carried out in Kosovo regarding the imunological status of women of fertile age. The goal of this research was to examine the immunological status of women of fertile age in Kosovo and to evaluate the immune status of children below one year of age based on the immune status of mothers.

## Materials and methods

The retrospective and prospective epidemiological approaches were used in this study. Using the retrospective approach, the questionnaire designed specifically for this study consists of socio-demographic questions and information on the vaccination status of the participants. Using the prospective approach, the immunological status of measles was investigated through samples of serum from 433 female participants of fertile age (15-49 years) from the Pristina, Prizren and Gjilan regions. In the second phase, samples of 84 mothers and their children below one year of age were tested for inherited immunity to measles. Recruitment of study participants was carried out during their regular visits to primary health care institutions. All participants prior to participating in the research were informed orally and in writing of the study design and then gave their written consent. Mothers also gave their consent for their children. Samples obtained in the study were analyzed using enzyme-linked immunosorbent assay (ELISA) tests, to determine IgG and IgM.[14] All laboratory analyses of serums were performed at the Department of Microbiology of the National Institute of Public Health of Kosovo.

Continuous variables are summarised by means and standard deviation, while categorical variables are described by frequency and percentage. The Chisquare test was used to compare groups. Statistical analyses were performed with the IBM SPSS v12 software. P <0.05 was considered significant.

Ethical approvement

The study had been approved by The Ethic Committee of the Faculty of Medicine, University of Prishtina.

## Results

The mean age of female participants of fertile age was 29.11±7.91 years. The distribution of participants by age group is shown in Table 1. Most female aprticipants stated that their occupation was housewife (table 2). 54.7% of them declared that had been vaccinated with MMR, and 29.6% had been infected with measles. The highest vaccination rate, 91%, was among 15-19 year old females, as shown in Table 3. The lowest imunity rate, 79%, was found amongst women born between 1979 and 1983, as shown in Figrure 1. In an analysis of 84 mothers (mean age 27.51 ± 4.52 years) and their children below one year of age, 42 (50%) mothers confirmed that they had been vaccinated. Immunological status, however, revealed that 71 out of 84 (84.5 %) had immunity (chi-square; p < 0.05) (Table 4).

| Age group (years) | Frequency | Percentage (%) |
|---|---|---|
| 15-19 | 46 | 10.6 |
| 20-24 | 88 | 20.3 |
| 25-29 | 118 | 27.3 |
| 30-34 | 81 | 18.7 |
| 35-39 | 46 | 10.6 |
| 40-44 | 32 | 7.4 |
| 45-49 | 22 | 5.1 |

**Table 1.** Fertile age female sample by age groups.

| | Frequency | Percentage (%) |
|---|---|---|
| Housewife | 350 | 80.8 |
| Economist | 4 | 0.9 |
| Pharmacist | 1 | 0.2 |
| Hairdresser | 3 | 0.7 |
| Nurse | 16 | 3.7 |
| Engineer | 1 | 0.2 |
| Medical doctor | 1 | 0.2 |
| Student | 30 | 6.9 |
| Police officer | 2 | 0.5 |
| Teacher | 7 | 1.6 |
| Lawyer | 3 | 0.7 |
| Technical services | 2 | 0.5 |
| Supervisor/Manager | 1 | 0.2 |
| Sailor | 12 | 2.8 |

**Table 2.** Occupation of female participats.

| Age group (years) | | Vaccination Status n(%) | Past infection status n(%) |
|---|---|---|---|
| 15-19 | Yes | 42(91.3) | 3(6.5) |
| | No | 4(8.7) | 43(93.5) |
| 20-24 | Yes | 74(84.1) | 23(26.1) |
| | No | 14(15.9) | 65(73.9) |
| 25-29 | Yes | 76(64.4) | 35(29.7) |
| | No | 42(35.6) | 83(70.3) |
| 30-35 | Yes | 30(3.0) | 25(30.9) |
| | No | 51(63.0) | 56(69.1) |
| 35-39 | Yes | 9(19.6) | 15(32.6) |
| | No | 37(80.4) | 31(67.4) |
| 40-44 | Yes | 5(15.6) | 16(50.0) |
| | No | 27(84.4) | 16(50.0) |
| 45-49 | Yes | 1(4.5) | 11(50.0) |
| | No | 21(95.5) | 11(50.0) |

**Table 3.** Vaccination and past infection status of fertile age females, by age groups.

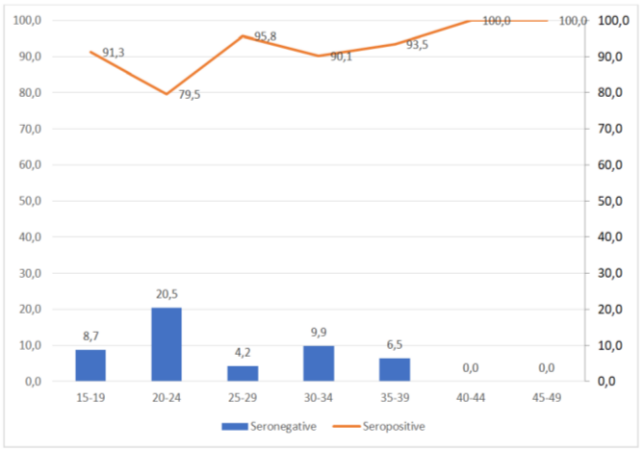


**Figure 1.** Serology status of respondents who participated in the research, by year of birth.

| | | Child | | |
|---|---|---|---|---|
| | | IgG positive n(%) | IgG negative n(%) | p |
| Mother | Seronegative | 20 (23.8) | 7 (8.3) | 0.043 |
| | Seropositive | 52 (61.9) | 5 (6.0) | |

**Table 4.** IgG in children below one year of age, according to maternal immune status.

## Discussion

Despite the WHO goal of eradicating measles by 2020, and despite the existence of a highly effective vaccine, measles continues to persist and has increased in prevalence in recent years. In Kosovo, this makes it very important to understand the characterisation trends and to identify any immunological gaps, considering the volatile political past of the country, particularly since 1988.

The results of this study showed that 259 out of 433 subjects (59.8%) had been vaccinated. Of those born between 1974 and 1988, the majority (76.2%) had been vaccinated, while only 24.2 % of those born between 1954 and 1973 had been vaccinated. Considering that the measles vaccine first came into public use in 1963,[5] this is not an unexpected result in terms of the uptake of the measles vaccine during the period 1954-1973. The percentage of vaccine uptake almost doubles for those born between 1974 and 1978 (64.4%) and increases to 84.1% for those born between 1979 and 1983 and then to 91.3% for those born between 1984 and 1988. By comparison, a study conducted by Vyse et al.

reveals that a significant proportion of those born between 1996 and 1999 had no evidence of a specific antibody against measles, mumps, or rubella in England and Wales.[15]

Although, Dine et al. found in their study that even 26 to 33 years after the first or second dose of measles vaccine, more than 90% of respondents had a high titer of antibodies considered protective for measles.[16]

When tested for their immunological status, those born between 1979 and 1983 had the lowest immunological status with regards to measles, at only 75.5%, although their vaccination status showed that 84.1% of them stated that they had received the measles vaccine. By comparison, in their research Tomaskova et al. found that the overall seroprevalence among citizens of the Czech Republic had reached 93.0%.[17]

In our study, 85.7% of children below one year of age who had not received the vaccine were found to be seropositive. Tomaskova et al. show in their results that only 62% of children at the age of one year are seropositive.[17] Wang et al also observed 71.5% measles seropositivity among infants below 7 months of age in their study.[18]

As such, herd immunity was not reached and this creates pockets for possible measles outbreaks, considering what a highly contagious and serious disease measles is.

Considering inherited immunological vulnerability, the mobility scale and the immunological situation in Europe,[5] policy makers in Kosovo need to decide on best practice, and quickly implement all vaccine-related policies, to prevent any possible outbreaks. Catch-up campaigns would help to improve the sustainability of the immunisation programme and would help the government of Kosovo towards achieving measles eradication.

Endemic transmission is defined as continuous transmission of an indigenous measles virus for a period of 12 months or more in a defined geographical area. The diseases are eliminated when the absence of endemic cases for a period of at least 12 months has been documented by a well-performing surveillance system.[19]

A campaign tailored according to the target population should have realistic expectations. The more people we vaccinate against measles, the closer we will come to the WHO's measles eradication goal. The more future mothers we vaccinate, the more immune babies will be born, giving them passive protection until they reach the vaccination age, and improving their chances of a healthy and long life.

## Conclusions

This situation underlines the need for strong, reliable and effective surveillance systems that are able to detect and prevent possible outbreaks. Focusing on and targeting unvaccinated females (before they get pregnant) would ensure passive immunisation at their babies as a protective measure, until they reach the measles vaccination age.

## Declaration of Interest

The authors report no conflict of interest.

## References

1. Mulders MN, Rota PA, Icenogle JP, Brown KE, Takeda M, Rey GJ et al. Global measles and rubella laboratory network support for elimination goals, 2010–2015. Morbidity and Mortality Weekly Report. 2016;65(17):438-42.
2. World Health Organization Regional Office for Europe. WHO EpiData no. 7/2019.
Available on: https://www.euro.who.int/en/health-topics/disease-prevention/vaccines-and immunization/publications/surveillance-and-data/whoepidata/who-epidata,-no.-72019
3. Pratiwi R, Akbar F. H, Pasiga B, Samad et al. Description of the Level of Knowledge, Attitude, Preparedness and Willingness of the Faculty of Dentistry Faculty of Hasanuddin University in Caring for People with Hiv/Aids. J Int Dent Med Res. 2019; 12(2): 688-94
4. European Centre for Disease Prevention and Control. Monthly measles and rubella monitoring report. 2020. Available on: https://www.ecdc.europa.eu/en/publications-data/monthly-measles-and-rubella-monitoring-report-january-2020
5. Patel MK, Gacic-Dobo M, Strebel PM, Dabbagh A, Mulders MN, Okwo-Bele J-M, et al. Progress toward regional measles elimination—worldwide, 2000–2015. Morbidity and Mortality Weekly Report. 2016;65(44):1228-33.
6. Salimović-Bešić I, Musa S, Tihić N, Arapović J, et al. Epidemiology of measles cases and phylogenetic analysis of the virus circulated in the Federation of Bosnia and Herzegovina during 2018: implications for elimination efforts. Med Glas (Zenica). 2020;17(1):98-105
7. Hagstam P, Böttiger B, Winqvist N. Measles and rubella seroimmunity in newly arrived adult immigrants in Sweden. Infectious Diseases. 2019;51(2):122-30.
8. Gay NJ. The theory of measles elimination: implications for the design of elimination strategies. The Journal of infectious diseases. 2004;189(Supplement_1):S27-S35.
9. Black F.L. The role of herd immunity in control of measles. The Yale Journal of Biology and Medicine 1982; 55:351-60.
10. Isuf Dedushaj IH. Epidemiologjia speciale e sëmundjeve ngjitëse. Prishtinë: Koha; 2005:11-12.
11. Ministry of Health.Plani strategjik i imunizimit, 2019-2021. Prishtina: 2019; 22-23. Available on: https://msh.rks-gov.net/wp-content/uploads/2019/07/Plani-i-Imunizimit-07.06.2019-liki.pdf
12. National Institute of Public Health of Kosovo. Analysis of Measles outbreak in Kosovo 2017-2018. Prishtina; 2018: 6-8.

13. Thompson KM, Odahowski CL. Systematic review of measles and rubella serology studies. Risk Analysis. 2016;36(7):1459-86.
14. Souza VAUFd, Pannuti CS, Sumita LM, Albrecht P. Enzyme-linked immunosorbent assay (ELISA) for measles antibody: a comparison with haemagglutination inhibition, immunofluorescence and plaque neutralization tests. Revista do Instituto de Medicina Tropical de São Paulo. 1991;33(1):32-6.
15. Vyse A, Gay N, Hesketh L, Pebody R et al. Interpreting serological surveys using mixture models: the seroepidemiology of measles, mumps and rubella in England and Wales at the beginning of the 21st century. Epidemiology & Infection. 2006;134(6):1303-12.
16. Dine MS, Hutchins SS, Thomas A, Williams I, Bellini WJ, Redd SC. Persistence of vaccine-induced antibody to measles 26–33 years after vaccination. The Journal of infectious diseases. 2004;189(Supplement_1):S123-S30.
17. Tomášková H, Zelená H, Kloudová A, Tomášek I. Serological survey of measles immunity in the Czech Republic, 2013. Central European journal of public health. 2018;26(1):22-7.
18. Wang Z, Yan R, He H, Li Q, Chen G, Yang S, et al. Difficulties in eliminating measles and controlling rubella and mumps: a cross-sectional study of a first measles and rubella vaccination and a second measles, mumps, and rubella vaccination. PLoS One. 2014;9(2):e89361.
19. Santibanez S, Hübschen J.M, Ben Mamou M.C, Muscat M et al. Molecular surveillance of measles and rubella in the WHO European Region: new challenges in the elimination phase. Clinical Microbiology and Infection. 2017;23: 516-23.