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IgG antibody prevalence suggests high immunization needs in newcomers to Luxembourg, 2012

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ABSTRACT

Vaccine coverage of the general population in Luxembourg is high, but refugees or asylum seekers may be incompletely vaccinated and susceptible to vaccine-preventable diseases.

In order to assess protection rates, serum and oral fluid samples were collected from 406 newcomers aged between 13 and 70 years arriving between May and September 2012. Sera were screened for IgG antibodies against measles, rubella, mumps, hepatitis B, tetanus, diphtheria and pertussis. Oral fluid samples were screened for antibodies against measles, mumps and rubella virus to investigate their suitability for antibody prevalence studies.

More than 90% of the participants had IgG antibodies against rubella, 73% against measles and 56% against mumps. Less than 19% had anti-HBs antibodies. Nearly 84% of the participants had an adequate protection against tetanus, 73% against diphtheria and 40% had pertussis antibodies. 93%, 95% and 78% of the measles, rubella and mumps test results obtained with serum and oral fluid were concordant.

The majority of the participants lacked antibodies against at least one of the measles/mumps/rubella (58%) and diphtheria/tetanus/pertussis (72%) vaccine components and against hepatitis B virus (82%) and might thus profit from vaccination. Oral fluid is a suitable alternative and non-invasive specimen for measles/rubella antibody prevalence studies.

1. Introduction

In Luxembourg, vaccination against a number of infectious diseases is part of the national routine childhood immunization programme. High coverage rates are currently reached for hepatitis B (HepB third dose coverage: 94%) and diphtheria, tetanus and pertussis (DTP fourth dose coverage: 95%) vaccine, while there is room for improvement concerning the second dose of measles, mumps and rubella vaccine (measles-containing vaccine first dose: 99%, measles-containing vaccine second dose: 86%) [1]. Adolescents or adults who arrive in Luxembourg as refugees or asylum seekers may have an incomplete vaccination history and may still be susceptible to vaccine-preventable diseases. Immigrants were, for instance, identified as one of the high-risk groups in Europe for contracting measles [2]. In Luxembourg with its overall high routine childhood immunization coverage rates, cases of vaccine-preventable diseases have become rare, but no information about the susceptibility in newcomers (between 2012 and 2016 a total of 8700 people were registered by the Luxembourg Ministry of Foreign and European Affairs [3]) is available. Seroprevalence studies conducted in the Luxembourg general population in 2000–2001 found age-standardized prevalence rates of 96.58, 75.40, 95.69 and 19.7% for measles, mumps, rubella and anti-HBs antibodies, respectively [4,5]. Diphtheria seronegativity was only 2.5% in less than 20 year olds, but increased to 42% in individuals more than 40 years of age, while the pertussis data were not conclusive [6]. No data about tetanus seroprevalence are available.

Between 53 and 74 cases of hepatitis C virus (HCV) per year were reported between 2011 and 2015 in Luxembourg, corresponding to a disease incidence of 10.1 to 14.5 cases per 100,000 population [7]. Knowledge about HCV infection rates also among newcomers is valuable for public health decision makers, because early diagnosis and treatment of HCV can result in virus clearance and mitigation of transmission [8].

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Oral fluid (OF) as a non-invasive specimen may be an attractive alternative to blood. Several measles, mumps or rubella seroprevalence studies based on OF [e.g. 9,10–13] as well as comparisons between OF and serum using different assays are available [e.g. 14,15–18]. However, systematic comparisons between the two specimen types using the same assays seem scarce [19,20].

The aim of the present study was to investigate the prevalence of IgG antibodies against different vaccine-preventable diseases in newcomers to Luxembourg in order to identify immunization gaps and needs, to estimate the burden of HCV infection and to assess the usefulness of OF as a non-invasive specimen for measles, mumps and rubella antibody screening.

2. Methods

About 10 ml of blood and two OF samples (Oracol, Malvern Medical Developments Ltd, Worcester, England) were collected after written informed consent from the participants or their legal representatives. Clinical material was obtained from all consenting refugees or asylum seekers of at least 13 years of age arriving between May and September 2012 in Luxembourg (n = 406). Personal data such as sex, age and country of origin were recorded. Access to donor identity was restricted to members of the Division de l'Inspection Sanitaire of the Luxembourg Ministry of Health involved in the investigation. For laboratory testing and data analysis, unique sample identifiers were assigned to the clinical samples and the completed questionnaires. All samples were transported on the day of collection to the laboratory, where serum was extracted from the blood samples and stored at -20 °C until further processing. The Oracol collection devices were rinsed in 1 ml of transport medium and the extracted liquid of the two samples per donor was pooled and then stored at −20 °C. Commercial ELISA kits were used to screen serum samples for IgG antibodies against measles virus (MV), rubella virus (RV), mumps virus (MuV) (Microimmune Ltd, Hounslow, UK), hepatitis B and C virus (HBV and HCV) (Diasorin, Saluggia, Italy), tetanus, diphtheria and pertussis (virion\serion, Würzburg, Germany). All anti-HBs positive and equivocal samples were further investigated using a total anti-HBc antibody ELISA kit (Murex anti-HBc (total), Diasorin, Saluggia, Italy) to distinguish participants who were vaccinated from those with natural infection. For the interpretation of the results, kit cut-off values were used and manufacturers' instructions were followed. OF samples were screened for IgG antibodies against MV, RV and MuV (Microimmune Ltd, Hounslow, UK). For the purpose of this study, participants with negative or equivocal test results were considered as susceptible, people with positive IgG antibody results as protected. Differences in prevalence of IgG antibodies by sex, age-group and country/region of origin were evaluated using the chi-square or Fisher exact test, where appropriate. A p-value less than .05 was considered as statistically significant. The analysis was conducted using the Simple Interactive Statistical Analysis (SISA) software [21]. The study was approved by the National Ethics Committee of Luxembourg (N° 201205/10).

3. Results

Participants included 176 females (43%) and 230 males (57%) between 13 and 70 years of age (average 30 years) from 30 different countries, including the Balkans (7 countries, n = 355 participants, 87%), the Middle East and Asia (MEA, 7 countries, n = 19 participants), Africa (12 countries, n = 19 participants) and the Newly Independent States and Russia (NISR, 4 countries, n = 13 participants). More than half of the people (n = 228, 56%) came from three countries: Montenegro (n = 88), Bosnia and Herzegovina (BIH, n = 77) and Albania (n = 63).

3.1. Measles, mumps, rubella

More than 90% (n = 367) of the participants had IgG antibodies against RV, while only about 73% (n = 295) and 56% (n = 229) had antibodies against MV and MuV (Fig. 1). For all three diseases the highest antibody prevalence was found among older participants and the lowest among the 21–30 year olds (Fig. 1) (21–30 year olds versus >30 year olds: RV: $p > .05$, MV and MuV: $p < .05$). Especially for rubella and mumps a higher percentage of females than males were susceptible (rubella: 13 versus 7%, mumps: 54 versus 36%, $p < .05$) while for measles the percentages were very similar (28 versus 27%, $p > .05$). For RV the highest percentage of susceptibles originated from Africa and MEA (10.5%) and the lowest from NISR (7.7%, $p > .05$), while the highest and lowest percentages of MV negatives were from NISR (30.8%) and from MEA (10.5%, Table 1, $p > .05$). Most susceptibles to MuV came from the Balkans (45.9%), while the lowest percentage was found in participants from Africa (21.1%, $p < .05$). There were considerable differences in susceptibility between the Balkan states, ranging for RV from 5.7% in Montenegro to 20.8% in BIH ($p < .05$), for MV from 19% in Albania to 35.2% in Montenegro ($p < .05$) and for MuV from 25.4% in Albania to 59.7% in BIH ($p < .05$) (Table 1).

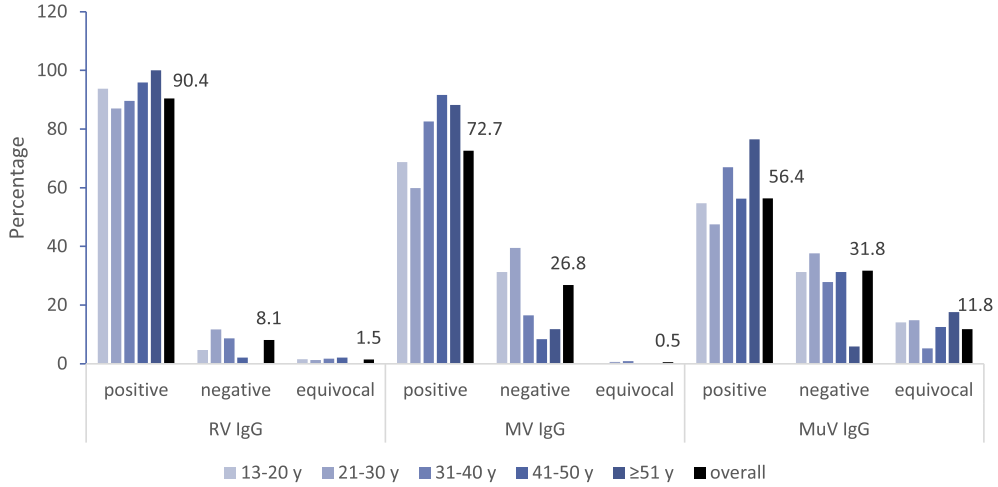

Fig. 1. Seroprevalence of IgG antibodies against rubella virus (RV), measles virus (MV) and mumps virus (MuV) by age groups in 406 newcomers to Luxembourg, 2012.