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Immunity against measles, mumps, rubella, varicella, diphtheria, tetanus, polio, hepatitis A and hepatitis B among adult asylum seekers in the Netherlands, 2016

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ABSTRACT

Asylum seekers are a vulnerable population for contracting infectious diseases. Outbreaks occur among children and adults. In the Netherlands, asylum seeker children are offered vaccination according to the National Immunization Program. Little is known about protection against vaccine-preventable diseases (VPD) in adult asylum seekers. In this 2016 study, we assessed the immunity of adult asylum seekers against nine VPD to identify groups that might benefit from additional vaccinations. We invited asylum seekers from Syria, Iran, Iraq, Afghanistan, Eritrea and Ethiopia to participate in a serosurvey. Participants provided informed consent and a blood sample, and completed a questionnaire. We measured prevalence of protective antibodies to measles, mumps, rubella, varicella, diphtheria, tetanus, polio type 1–3 and hepatitis A and B, stratified them by country of origin and age groups. The median age of the 622 participants was 28 years (interquartile range: 23–35), 81% were male and 48% originated from Syria. Overall, seroprotection was 88% for measles (range between countries: 83–93%), 91% for mumps (81–95%), 94% for rubella (84–98%), 96% for varicella (92–98%), 82% for diphtheria (65–88%), 98% for tetanus (86–100%), 91% (88–94%) for polio type 1, 95% (90–98%) for polio type 2, 82% (76–86%) for polio type 3, 84% (54–100%) for hepatitis A and 27% for hepatitis B (anti-HBs; 8–42%). Our results indicate insufficient protection against certain VPD in some subgroups. For all countries except Eritrea, measles seroprotection was below the 95% threshold required for elimination. Measles seroprevalence was lowest among adults younger than 25 years. In comparison, seroprevalence in the Dutch general population was 96% in 2006/07. The results of this study can help prioritizing vaccination of susceptible subgroups of adult asylum seekers, in general and in outbreak situations.

1. Introduction

In recent years there has been a large influx of refugees in Europe. In several countries of origin, public health systems collapsed and vaccination programmes have been interrupted due to war, political or economic instability, resulting in inconsistent vaccination coverage among refugee populations [1]. In the EU, outbreaks and isolated cases of several vaccine-preventable diseases (VPD), such as measles [2], hepatitis A [3,4], varicella [5] and diphtheria [6], have been reported among both children and adult refugees.

The World Health Organization recommends vaccination of refugees, asylum seekers and migrants according to the host countries' vaccination programme if they intend to stay in a country for more than one week. Considering the outbreak potential, vaccination against measles, mumps and rubella (MMR), as well as polio should be prioritized [7]. In the Netherlands, the vaccination status of asylum seeker children and adolescents aged 0–18 years is evaluated within 6 weeks after arrival, and vaccinations are updated according to the national immunization program (NIP) [8]. The vaccination status of adult asylum seekers however is not routinely

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evaluated. Two recent serosurveys from Germany found that immunity among adult asylum seekers was relatively high but might still be insufficient to achieve herd immunity for measles, mumps, rubella, varicella and diphtheria [9–11].

We conducted a seroprevalence survey in the Netherlands among adult asylum seekers to determine the seroprevalence against nine VPDs. By identifying immunity gaps and potential vaccination needs among adult asylum seekers, results of this study can aid the development of vaccination policies for asylum seekers.

2. Materials & methods

2.1. Study design

In July and August 2016, we performed a cross sectional serological survey among adult asylum seekers living in three large reception centres in The Netherlands.

2.2. Study population

Asylum seekers that met the following inclusion criteria were eligible to participate in the study: (i) 18 to 45 years of age, (ii) originating from Syria, Iran, Iraq, Afghanistan, Eritrea and Ethiopia, and (iii) living in a reception centre in the Netherlands. We chose this age range based on these reasons: insufficiently vaccinated asylum seeker children below the age of 19 years are already offered vaccination in the Netherlands and persons above the age of 45 years are more likely to have protective antibody levels due to natural infection [9]. Also, the majority of adult asylum seekers housed in Dutch reception centres were younger than 45 years (>80%) [12]. The countries we selected represented the countries where most asylum seekers in The Netherlands originated from in 2015 [13].

2.3. Participant recruitment

The Central Agency for the Reception of Asylum Seekers (COA) is responsible for the reception of asylum seekers and offers housing during the (first) asylum procedure. In consultation with COA, three reception centres were selected as study sites based on convenience regarding travel distance and size of the centre. These three centres housed ~1750 (8%) asylum seekers of the ~22,000 asylum seekers present in the Netherlands who met the inclusion criteria (personal communication COA, data as on 1-2-2016). One week prior to data collection, eligible participants received an invitation letter in Arabic, Farsi, Tigrinya, Amharic, Dutch or English. A flyer with icons describing the study graphically was included to also reach illiterate asylum seekers. Posters with information about the study were placed in the communal areas. In addition, personnel from the centres orally informed eligible study participants.

2.4. Data collection

Two to four consecutive sampling days were held at each centre in July and August 2016. On these sampling days, interpreters (Arabic, Farsi, Tigrinya and Amharic) explained the study aim and procedures to eligible persons, and assisted with filling in the informed consent form and the questionnaire. The questionnaire contained questions about demographics (sex, age, country of birth, educational level according to the UNESCO International Standard Classification of Education), and whether the person grew up in an urban or rural environment. Also, participants were asked whether they had received vaccinations as a child, and whether they would accept any future vaccination if indicated and offered to them in the Netherlands. To prevent potentially lower participation of women due to cultural reasons, we specifically recruited female nurses to collect a blood sample from all participants (8.5 mL, BD Vacutainer® SSTTM II Advance tubes). All data were processed anonymously: the questionnaire and blood sample were labelled with a unique study number and no person identifiable information was collected.

2.5. Serological analysis

After sample collection, blood samples were kept at room temperature. Upon transfer to the National Institute for Public Health and the Environment at the end of the sampling day, samples were stored in the refrigerator until further processing the next morning. After centrifugation, serum aliquots were filled out and were stored at −20 °C.

IgG antibodies against measles-, mumps-, rubella- and varicella virus, and diphtheria and tetanus were determined using fluorescent bead-based multiplex immunoassay (Luminex xMAP technology), as described before [14,15]. In all assays a reference, controls and blanks were included on each plate. All analysis was performed with a Bio-Plex 200 in combination with Bio-Plex manager software (Bio-Rad Laboratories, Hercules, CA).

Hepatitis A and hepatitis B (markers: anti-HBc, HBsAg, anti-HBs) serology was performed using chemoluminescence assays performed on the ADVIA Centaur XP assay system (Siemens HBsAgII assay, HBcT, aHBs2, AHAVT). A positive test result for HBsAg was confirmed by a neutralisation assay (Siemens) and/or by PCR (COBAS Taqman, Roche).

Poliovirus neutralising antibody titres against serotypes 1, 2, and 3 were determined by the neutralisation test (NT) using Sabin vaccine strains, as recommended by the WHO [16].

Participants were considered protected when IgG concentrations were above or equal to the following disease-specific cut offs: ≥0.20 IU/mL for measles, ≥45 IU/mL for mumps, ≥10.0 IU/mL for rubella, 0.26 IU/mL for varicella, ≥0.01 IU/mL for diphtheria, ≥0.01 IU/mL for tetanus, ≥20 mIU/mL for hepatitis A and >10 mIU/mL for hepatitis B (anti-HBs). For hepatitis B, vaccine-induced immunity is defined as anti-HBs positivity without other markers. Anti-HBc-, in combination with anti-HBs-positivity indicates a resolved infection with immunity, while anti-HBc positivity with presence of HBsAg indicates a chronic infection. For poliovirus NT titres ≥8 were considered protective. For diphtheria and tetanus protective immunity was further subdivided into basic protection (0.01–0.099 IU/mL) and full protection (≥0.1 IU/mL). Hereafter, we refer to seroprevalence of protective antibody levels as seroprevalence.

2.6. Statistical analyses

Serological results for measles, mumps, rubella and varicella were available for all study participants (n = 622). For diphtheria, tetanus, and hepatitis A, seroprevalence results were available for 620 participants and for hepatitis B for 617 participants, respectively. Due to limited resources, we only tested a subset of samples (n = 300, 48%) for the presence of antibodies against polio virus types 1–3. We used SPSS (IBM Corp, version 24) to determine the subset of samples, that constituted of a random selection of 100 sera from Syrian participants (as this was the largest group), and 50 sera each from participants from other eligible countries.

We calculated seroprevalences, determined exact 95% confidence intervals (Clopper Pearson) and stratified seroprevalence between gender, age groups (18–25, 26–35, 36–45) and country of birth using Chi square tests or Fisher's exact tests. For the comparisons of seroprevalence between countries of birth, we excluded participants from Ethiopia due to the low sample size (n = 2). To investigate trends in seroprevalence between age groups, we used the Cochrane Armitage Trend test. We tested

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