Chapter 2
Access and Barriers to Childhood Immunization Among Migrant Populations

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2.1 Vaccine Preventable Diseases in the EU: From Jenner's Vaccination to the European Vaccine Action Plan 2015–2020

Childhood vaccination programmes are considered among the most effective prevention services. In Europe vaccination programmes have a long tradition started in the late XIX century, when Jenner's vaccination was used for mass campaigns against smallpox. The modern childhood immunisation programmes have been implemented after the 1950s with the introduction of tetanus, diphtheria, polio, and subsequently pertussis vaccination. In the 1990s the introduction of hepatitis B vaccination (HBV) and, in a short time, the arrival of acellular pertussis vaccines, Haemophilus influenza type b (Hib), pneumococcal (PNC) and meningococcal (Men) conjugate vaccines improved the vaccination offer. During the latest years vaccination offer has been further enlarged with the availability of varicella, rotavirus and human papillomavirus (HPV) vaccines. Availability of new vaccines offered new opportunities but increased the complexity of the childhood vaccination programme. In many European countries introduction of new vaccines was hampered by low budget availability and competition at national level with other healthcare services (King et al. 2008). Therefore, notwithstanding the availability of safe and effective vaccines, in many EU countries there are still gaps and vaccination offer is limited to the "old" vaccines (Haverkate et al. 2012).

The EU, as well as the larger WHO European Region, adopted the European Vaccine Action Plan (EVAP) 2015–2020 (World Health Organisation 2014). Sustainability of polio-free status, elimination of measles and rubella and control of

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hepatitis B infection are the three disease-related EVAP goals. In addition, EVAP underlines the need for having a common evidence-based approach on new vaccines introduction at European level, together with an effort to make vaccination programmes sustainable and equitably extended to all population groups.

In the EU equity is not only an issue between member states (different budget availability and subsequently different vaccination offer) but also within each country. Vaccination coverage among disadvantaged groups like migrants, refugees and travellers' communities (Roma, Sinti, Irish travellers) is often lower than the average population (Mipatrini et al. 2017).

Language barriers, lack of documents, poor education, are reported among the causes of missed opportunities for vaccination in these groups. On average, nearly 95% of children born in Europe receive the complete three-dose series of diphtheria, pertussis and tetanus vaccine by the age of 1 year. However, most of those children not accessing vaccination services belong to migrant and disadvantaged families. A strong call to "pay special attention to migrants, […], in ensuring their eligibility and access to (culturally) appropriate immunization services and information" is listed among the priority actions of the EVAP.

2.2 Poliomyelitis

The European Region was certified polio-free in 2002 and has maintained this status, notwithstanding acute threats like the outbreak in Tajikistan in 2010 (WHO 2010), the detection of silent circulation of wild polioviruses in Israel in 2013 (Shulman et al. 2014), and the cases of vaccine-derived poliovirus infection in Ukraine in 2015 (WHO 2016). Latest polio cases occurred in an EU country were reported from the Netherlands (van Wijngaarden and van Loon 1993–1994; Oostvogel PM et al. 1994). From September 1992 to February 1993, 71 polio cases and 2 deaths were confirmed in a population refusing vaccination for religious reasons. Since then no paralytic case has been reported from any EU member state in the presence of effective either acute flaccid paralysis (AFP) surveillance or environmental monitoring.

Oral polio vaccine (OPV) is the first-choice vaccine in the presence of local circulation of wild polioviruses. Once the polio-free status is certified, switch to inactivated polio vaccine (IPV) is needed in order to avoid the risk of introduction of vaccine-derived polioviruses (VDPV) in the environment. The EU countries progressively switched to IPV-only schedule starting from the polio-free status declaration. At present IPV is the only vaccine used for childhood immunisation in the EU (ECDC, Vaccine scheduler 2017). Vaccination coverage levels for three doses of IPV at 24 months are on average over 90% in most EU countries (WHO, CISID 2014). In the presence of high levels of polio vaccine coverage, the risk of having paralytic cases is very low, but the silent circulation of either wild or vaccine-derived polioviruses cannot be ruled out, as recently demonstrated in Israel. Should such silent circulation occur in an, even limited geographic area where pockets of

under-vaccinated population are clustered, risk of disease becomes higher. During the recent outbreak in Ukraine, the ECDC highlighted some potential issues in countries bordering the Ukraine, like Romania, where average vaccination coverage was sub-optimal (88%). In addition, estimate on vaccine uptake in this country could have been underestimated because of lack of birth certificates or other documentation in socio-economically disadvantaged groups such as Roma. The geographical clustering of such groups can result in a situation where vaccination coverage is significantly lower than the average in the country, posing a serious threat for poliovirus circulation.

Data on polio vaccination coverage among citizens of foreign origin in EU is lacking. Few surveys have been recently carried out among refugees. In Italy, more than 99% of refugees coming from Asia and Africa and temporarily hosted in a camp were found having high immunity levels against polioviruses (Tafuri et al. 2010). In a group of refugees from Syria in Germany, 12 out of 629 (6.3%) children less than 3 years of age were positive for Sabin-like viruses in the stools, sign of recent vaccination with OPV. No wild polioviruses were found (Bottcher et al. 2015). In France, 64.4% of HIV-infected patients coming from sub-Saharian Africa had protective antibodies against the three polioviruses (Mullaert et al. 2015).

In conclusion, even if the risk for having paralytic polio cases in the EU is considered low, however children belonging to some subpopulation groups like Roma or migrants should be considered at higher risk because of low immunity levels.

2.3 Tetanus, Diphtheria, and Pertussis

Tetanus vaccination does not provide any herd immunity effect and therefore any single child not vaccinated is at high risk of disease. During the period 2010–2014, between 88 and 149 cases of tetanus have been reported in EU countries each year. The highest number of cases has been notified by Italy, Poland and France. Most of the cases occurred in adults and all fatal cases were in people aged 65 years and above (ECDC 2016d). Definitively, tetanus is under control in the EU, but still come effort must be put in place to prevent cases in those populations with low vaccination coverage or waning immunity.

Vaccination coverage among migrants have been often found to be lower in comparison with EU-born individuals. Construction workers coming from Egypt and Morocco had lower immunisation status in comparison with Italian colleagues, notwithstanding tetanus vaccination is required by Italian law for construction workers (Rapisarda et al. 2014). Workers in the agricultural sector coming from EU had higher tetanus coverage (91%) compared with non-EU workers (81%) in an Italian survey (Tabibi et al. 2013). Lower seroprevalence levels were found in the Netherlands in first-generation migrants coming from non-Western countries born before 1984, but the overall seroprevalence was over 94% in the whole population sample (Steens et al. 2010). A survey conducted in a sample of HIV infected

individuals in Austria showed in migrants lower seroprevalence levels against tetanus (Grabmeier-Pfistershammer et al. 2015).

Newly arrived migrants, including children, may be a population at higher risk, due to poor access to vaccination in the country of origin. Only 27% of newly arrived migrant children in Switzerland had protective antibody levels against tetanus (de la Fuente et al. 2013).

Tetanus remains a threat for non-EU adults, especially those with higher occupational risk. In addition, special attention should be paid to the immunisation status of newly arrived migrant children.

Diphtheria cases are still reported from several EU countries. Between 2010 and 2014 number of reported cases ranged from 14 to 35 per year. In 2015, an asylum seeker originating from Afghanistan was diagnosed with respiratory diphtheria in Finland (Sane et al. 2016). He arrived in Finland from Sweden. No secondary cases were associated with this case. In France, a survey conducted among HIV-infected patients coming from sub-Saharian Africa showed protective antibodies against tetanus in 70.7% and against diphtheria in 69% of the sample (Mullaert et al. 2015).

Notwithstanding diphtheria is under control and only few clinical cases are notified in the EU, nevertheless available evidence shows that not vaccinated children are still at risk. Pertussis vaccination had a great impact on pertussis incidence worldwide. Childhood immunisation mainly aims at preventing severe pertussis cases in young infants. However, due to the limited duration of immunity after both vaccination and natural infection, repeated boosters are needed in order to decrease *Bordetella pertussis* circulation among all population groups and subsequent transmission to infants. Resurgence of pertussis is reported from several EU countries during the last years. The reasons for such phenomenon are complex and still under scientific assessment. Recently, vaccination of women during the third trimester of pregnancy is providing promising results. Very little evidence is available on vaccination coverage among migrants and disadvantaged groups for pertussis (Mipatrini et al. 2017). Any specific vaccination strategy aimed at decreasing *B. pertussis* circulation should take into consideration that migrant population may represent a disadvantaged group in terms of access to vaccination services.

2.4 Measles and Rubella

Measles and rubella are targeted for elimination in Europe. In 2016 70% and 66% of the 53 Member States in the European Region had interrupted the endemic transmission of measles and rubella, respectively (O'Connor et al. 2017). Nevertheless, large measles outbreaks as well as cases of congenital rubella still occur in many EU countries. Between January 2016 and June 2017, over 14,000 measles cases have been reported in the EU, including 35 deaths. According to the WHO Health for All database, during the decade 2004–2013, 123 new congenital rubella cases have been reported by EU countries.

A systematic review has been recently carried out in order to assess the burden of measles among migrants in the EU (Williams et al. 2016). There is little evidence available on the real incidence on measles in migrant population in Europe: those studies that mentioned migrants frequently mixed them up with indigenous religious groups or ethnic minorities. Several cases studies on measles outbreaks in Europe mention ethnic minorities or among populations at higher risk, but fail to specify whether these include recent migrants or not. The largest ethnic minority clearly related to disproportionate measles risk is the Roma/Sinti group in Bulgaria and Romania.

The latest bulletin on congenital rubella and rubella in pregnancy published by the National Institute for Health in Italy (ISS, Istituto Superiore di Sanità) reports that 25 out of 163 (15%) cases of rubella in pregnancy notified over the period 2005–2016 are in women of foreign origin (Giambi et al. 2017).

Data on vaccination coverage in migrants are not routinely collected (WHO Regional Office for Europe 2012). Few studies from individual EU countries (Germany, Italy, and Spain) report similar findings showing that migrant children are less likely to be vaccinated against measles. One German study, found that children of foreign origin had a 3-fold higher risk of being unvaccinated (Poethko-Muller et al. 2009). An Italian study reported measles vaccine coverage of 89.6% among children born outside of Italy compared with 87.3% in native children (Chiaradia et al. 2011). A study carried out in Catalonia, Spain, found a statistically significant difference in vaccine coverage rates between indigenous and immigrant children, for both the first (96.5% vs 85%) and the second dose (88.6% vs 78.3%) (Borras et al. 2007). Concerning rubella, studies carried out in Sweden and UK showed lower immunity levels in migrant than in native women (Kakoulidou et al. 2010; Hardelid et al. 2009).

In conclusion, there is strong evidence that large measles outbreaks involve ethnic minorities in the EU like Roma, but no data are routinely collected on the burden of disease among migrants. On the other hand, specific studies show that migrant children are less likely to be protected against measles in comparison with native population. In addition, disproportionate risk for rubella in pregnancy has been demonstrated in Italian women of foreign origin. In this perspective, specific measures should be implemented in order to close such potential immunization gaps and accelerate the measles and rubella elimination programme.

2.5 Meningococcal Invasive Disease

Meningococcal invasive disease is a rare but life-threatening disease in the EU. At present, the majority of cases are due to serogroup B, since serogroup C infection is mostly under control also thanks to extensive childhood vaccination programmes with meningococcal C conjugate vaccine (ECDC 2016c). Data on vaccination coverage on migrant children are not available and therefore there is no evidence of disproportionate risk of meningitis between migrant and native population (Mipatrini

et al. 2017). Since risk of disease is higher in children hosted in refugee camps or living in very crowded or poor hygiene conditions, meningococcal vaccination should be considered in refugees.

2.6 Hepatitis A

EU countries present different endemicity levels for hepatitis A. According to a recent systematic review most EU countries can be considered at a very low endemicity for hepatitis A, but few counties present either low or intermediate levels that may suggest local virus circulaiton (Carrillo-Santisteve et al. 2017). Hepatitis A outbreaks still occur in Europe. Recently large multi-country outbreaks have been reported either linked to contaminated food consumption (Tavoschi et al. 2015; Scavia et al. 2017) or sexual transmission (Werber et al. 2017; Beebeejaun et al. 2017; Freidl et al. 2017). Second generation migrant children have been highlighted as peculiar risk group (Whelan et al. 2013). Second generation children are susceptible to hepatitis A having been grown in a very low endemicity country and are at high risk of infection when visiting their country of origin.

Universal childhood and adolescent hepatitis A vaccination (HAV) is effective to stop local transmission both in outbreak situations and in areas at intermediate/high endemicity (WHO 2012). In the EU universal vaccination have been implemented only in Catalonia (Spain) and Puglia (Italy). HAV is recommended to risk groups in most EU countries. Following the recent evidence, vaccination should be actively offered to second generation migrant children.

2.7 Hepatitis B

Hepatitis B virus (HBV) can cause both acute and chronic infection. Risk of chronic disease is higher if the infection is acquired during childhood. Universal children and adolescent vaccination has shown to be very effective in controlling the disease and limiting the virus spread. However, due to the presence of chronic carriers, elimination of hepatitis B is hard to achieve in a reasonable timeframe.

The prevalence of HBsAg (hepatitis B surface antigen, a marker of infection) positive individuals varies significantly across the globe, with a clear correlation between HBsAg seroprevalence and socio-economic status, with high seroprevalence level in developing countries (Schweitzer et al. 2015). Even in the EU there is a distinct geographical variation with increasing rates from West to East and from North to South (ECDC 2016b). Overall, incidence of acute hepatitis B infection is declining in the EU, probably thanks to the successful implementation of vaccination programmes. On the other hand, almost 4.5 million people live with a chronic hepatitis B virus infection in the EU (Hope et al. 2014).

Several studies have investigated the prevalence of HBV infection among migrants. A systematic assessment carried out by the ECDC reports an estimate of two million cases of chronic hepatitis B infection among migrants from intermediate/high endemic countries and a prevalence of 6% for HBsAg (ECDC 2016a, b, c, d). The ECDC study estimates that the burden of chronic hepatitis B among migrants in relation to the overall number of infected cases to be around 25%. This estimate shows that migrants are disproportionally affected by chronic hepatitis B, since the proportion of migrants in the total population is 5% for migrants coming from HBV endemic countries (ECDC 2016a). According to the ECDC assessment, migrants born in south-east or east Asian countries are among the migrant groups with the highest number of infected cases (ECDC 2016a, b, c, d). A study carried out in Amsterdam showed that the incidence of new HBV infections was higher in both first- and second-generation migrants in comparison with the Dutch-born population, showing that the risk of acquiring the infection is related to habits and living conditions of the resident migrant population, independently from the prevalence of infection in the country of origin (Whelan et al. 2012).

In Germany, both first- and second- generation children and adolescents are at higher risk of infection. In particular, children with both parents with immigration background and first-generation children are at the highest risk (Cai et al. 2011).

Studies on hepatitis B vaccine coverage among migrant children are limited. A study conducted in a rural area in Germany found similar vaccination coverage among migrant and indigenous school age population (Mikolajczyk et al. 2008).

In conclusion, acute hepatitis B infection is declining in the EU, but migrant population continue to be disproportionally at risk. In particular, knowledge on local situation is needed in order to target prevention and screening efforts towards priority migrant groups.

2.8 Barriers to Childhood Immunization Programmes Among Migrant Children

Some evidence shows that migrant children are disproportionally exposed to vaccine preventable diseases. On the other hand, data on vaccine coverage in children with migrant background are scarce because they are not routinely collected. Similarly, knowledge gaps still exist on which barriers prevent migrant groups from reaching high vaccination coverage. Lack of targeted vaccination programmes may explain this finding. Vaccination, more than other health care services, relies on robust communication strategies. In the absence of diversity-oriented and migrant-sensitive communication tools and organisation behaviour, migrant children can easily become a hard-to-reach group for vaccination programmes (Rosano et al. 2017). Recently, several countries in the EU are considering the introduction of vaccine mandates in order to counteract the increasing vaccine hesitancy among the public. A law requiring parents to vaccinate their children against 10 diseases by

school age raised a vigorous debate in Italy (Day 2017). In France a similar law requiring immunisation against 11 diseases is going to be enforced starting from 2018 (APMNews 2017). Introduction of mandates may increase vaccine coverage among those migrant families that do not vaccinate their children because of lack of information or poor access to health care services. As a matter of fact, vaccine mandates for access to school may represent an effective filter to reach this population group. Finally, strong efforts should be put in place to better integrate marginalised groups like Roma/Sinti in relation to measles and rubella elimination efforts in Europe.

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