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Behavioural and social drivers of vaccination among child and adult migrants in Morocco: A qualitative interview study

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ABSTRACT

Background: The World Health Organization's Immunization Agenda 2030 calls for ensuring universal access to vaccination across the life course for all groups including migrants. The aim of this study is to explore factors driving uptake of vaccination among migrants in Morocco.
Methods: We conducted a multi-site exploratory qualitative study using semi-structured interviews with adult migrants and health professionals in Morocco. We did a hybrid thematic analysis guided by the WHO's Behavioural and Social Drivers of Vaccination (BeSD) uptake framework.
Results: We interviewed 23 migrant participants (15/23 female, mean age 30.0 years ±2.0, average time of stay in Morocco 4.72 years ±8.79) and 8 primary care professionals. We found that although migrant children and adults were entitled to free vaccinations, various individual, social, and practical issues influenced their motivation and uptake. For childhood vaccination, caregivers showed high confidence in vaccine benefits and safety, but faced administrative difficulties, limited information, orientation, and language barriers. For adult vaccination, mistrust and scepticism toward specific vaccines, such as the COVID-19 vaccine, persisted, mainly due to misinformation. Except for the tetanus vaccine for pregnant women and the COVID-19 vaccine, migrant adults were rarely offered adult or catch-up vaccinations, often due to the absence of health worker recommendations and non-verification of vaccine history. Migrants emphasized the need for improved communication with health professionals and addressing language barriers and called for increased sensitization to reduce vaccine scepticism and hesitancy, better information on service locations, particularly through community-based organizations and outreach efforts for hard-to-reach migrants.
Conclusions: Despite entitlement to vaccination services, vaccination uptake among migrants in Morocco may be influenced by various individual, social, and practical factors. Tailored and targeted interventions are urgently

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needed, including efforts to prioritize improving communication with health professionals, removing language barriers, and developing appropriate delivery and communication strategies for these communities.

1. Background

Essential Programmes on Immunization (EPI) have led to significant progress in combating vaccine-preventable diseases (VPDs) and preventing an estimated 154 million child deaths in the past 50 years [1]. The World Health Organization's Immunization Agenda 2030 (WHO IA2030) emphasizes the importance of ensuring universal access to vaccination over the life course and reaching all population groups, including migrants, without exclusion [2]. In addition, several reports by the WHO showed varying degrees of the inclusion of migrants in national public health and vaccination systems and highlighted the need to ensure universal and equitable access to vaccines for migrants, regardless of administrative status, age or gender, equal to that of nationals [3–5]. Despite this, some migrant communities (including refugees, asylum seekers and undocumented migrants) are considered under-vaccinated due to missed doses and boosters in their home countries and inadequate access to vaccination services [6,7]. Thus, they have been shown to face a disproportionate burden of VPDs, with multiple outbreaks occurring particularly in closed settings and due to precarity and overcrowded living conditions [3,8].

The drivers of vaccination uptake in migrants have been documented in high-income settings [9]. A global systematic review showed that multiple individual and social factors and accessibility issues may drive under-vaccination in migrant groups globally [10]. These included lack of awareness about vaccines, low trust in vaccines and healthcare institutions, structural inequalities and racism, inconvenient access points and cost [10]. Other studies in migrants in high-income countries have also shown that structural marginalization, social inequities, social exclusion upon arrival, and negative experiences in the host healthcare system can affect trust in healthcare providers and institutions and contribute to low vaccine acceptability among migrants [11–13]. Moreover, vaccine hesitancy among migrant communities and ethnic minorities has been reported in previous studies in both high- and low-income settings [14,15]. The COVID-19 pandemic has also highlighted deep inequalities in accessing vaccination services among adult migrants due to several barriers [3,8,16]. For example, a global review of determinants of vaccine uptake among migrants in Europe showed that difficulties navigating the host country's health system, language and administrative issues, and the indirect out-of-pocket financial cost of getting vaccinated were the main factors driving the uptake of COVID-19 vaccination [16].

Morocco, within the Middle East and North Africa (MENA) region, represents a country of transit and destination for a high number of migrants, particularly from sub-Saharan African countries and is a major global migrant hotspot [17]. According to the IOM, Morocco hosts an estimated 102,000 migrants and 9000 refugees as of mid-2022 [18]. Since 2013, there have been systematic efforts to improve living conditions and access to essential services for its growing migrant population [17]. In fact, Morocco is one of the countries in the MENA region that has made several efforts to integrate migrants into national health programs [19], and the first country in the region to commit itself politically and socially to the health of migrants and to develop a migrant-health specific strategy; the National Strategic Health and Immigration Plan covering the period 2021–2025 [20] Migrants in Morocco are entitled to free-of-charge emergency and primary healthcare services, including vaccination services in primary care facilities [20]. Despite entitlement to services, a study among sub-Saharan African migrant children in Casablanca showed that 57 % were not fully vaccinated according to the national immunization programme, and faced significant administrative difficulties and high waiting time. In addition, low knowledge about vaccination and vaccination calendar among caregivers, mother's education level and professional status were also associated with child's vaccination status [21]. While data on vaccination in adult migrants is lacking, during the COVID-19 pandemic, a report by IOM Morocco revealed that 52 % of migrants did not have access to the COVID-19 vaccine, of which 30 % wished to get vaccinated but were not able to [22]. Moreover, 21 % of those who refused to get the vaccine reported a lack of information about the vaccine [22]. Previous research in the Eastern Mediterranean region has shown that despite entitlement to services, migrant populations in the region may face informal social and cultural factors which drive uptake and utilization of services [23]. In Morocco, data on the drivers of vaccine uptake for routine childhood and adult vaccinations is lacking. Additionally, it is unclear whether adult migrants in Morocco are being offered catch-up vaccinations to complete doses they may have missed in their home countries. Understanding these drivers is important to define evidence-based approaches to vaccination for migrant groups in Morocco across the life-course. Therefore, the aim of this study is to explore the factors driving uptake of vaccination among migrants in Morocco, through the lens of both migrants and primary healthcare professionals. Using the WHO Behavioural and Social Drivers (BeSD) framework [24] and adapting it to the migrant population in Morocco, this study will help inform changes in the immunization program to promote life-course vaccination uptake within this group.

2. Methods

2.1. Study design and setting

We conducted an exploratory qualitative study using semi-structured interviews with migrants and healthcare professionals. The research design was framed using the WHO Behavioural and Social Drivers (BeSD) framework [24], developed to support vaccination planning and assess vaccine uptake by measuring several domains that influence vaccination behaviour and can be addressed by immunization programs. These domains include: (i) thoughts and feelings about vaccines; (ii) underlying social processes that drive or inhibit vaccination; (iii) motivations; and (iv) practical issues related to accessing and receiving vaccines. The BeSD model has been applied among diverse populations, including migrants, but has not previously been used nor adapted in this region, particularly among vulnerable groups with specific vaccination needs. We conducted semi-structured interviews carried out in-person with adult migrants (including caregivers and parents) and primary care health professionals. For pragmatic reasons, we also conducted one focus-group discussion in one location (Rabat) with young female migrant mothers from the same community. The study took place in three cities in Morocco: Rabat, Oujda and Agadir. These sites were chosen due to the high influx of migrants and the existence of a network of community-based organizations (CBOs) to support the recruitment of participants. All sessions with migrants were arranged at the premises of the migrant-supporting organizations in Morocco. All health professionals were recruited from primary healthcare centres in Rabat.

2.2. Participant recruitment

Purposive and convenience sampling methods were applied. We included adult migrants aged 18 years and over, including parents, regardless of age, gender, legal status and duration of stay in Morocco, who (or whose children) may or may not have received any vaccines during their stay in Morocco. We defined a migrant as a person who moves away from his or her place of usual residence, across an international border, temporarily or permanently, for a variety of reasons

[27]. For health professionals, we interviewed medical doctors, nurses, and midwives who worked at primary health centres in neighbourhoods where migrants live and who have experience attending to migrants. Migrant participants were recruited with support from local NGOs providing services to migrants.

2.3. Data collection procedure

The data collection took place in NGOs and civil society organizations serving migrants and vulnerable groups, located in neighbourhoods and areas where migrants lived across the three study sites. All activities were conducted in French, English, Arabic or Moroccan Dialect (Darija). Members of the research team took field notes (including nonverbal cues, notes on key narratives, and general observations) at the end of every session. Two topic guides were developed (See supplementary material): one for migrants and another for healthcare professionals. The development of the guides was informed by the WHO BeSD model. The topic guide was piloted in the first three sessions. In addition, prior to the study, it was circulated to authors with experience in vaccination studies in migrant populations globally (AD, SH, SE) for input. The feedback provided was used to improve the wording of the questions, refine the order of questions to improve conversational flow, and add prompts. The topic guide focused on perceptions and beliefs about vaccination, social processes related to vaccination decision-making, experiences with and access to vaccination services in Morocco (childhood, adult and catch-up) and recommendations to improve access and utilization of the services. We also collected socio-demographic information from migrants (age, sex, country of origin, time of stay in Morocco, education level, employment and legal status) and health professionals (age, sex, profession). All sessions were audio-recorded. Each semi-structured interview lasted between 25 and 47 min and the FGD lasted 90 min. Data collection was guided by the concept of information power [28], which holds that the more relevant information participants contribute, the fewer participants are needed. Rather than applying the concept of data saturation, critiqued for its conceptual ambiguity [29], we made a judgment call to conclude data collection when the richness and relevance of the data sufficiently addressed the study aims, alongside practical constraints related to time and access. Migrant participants were provided with refreshments during the interview sessions and transportation vouchers at the end of the sessions.

2.4. Data analysis

All sessions were uploaded onto and transcribed verbatim either using the NVivo transcription module or manually, for interviews conducted in Moroccan dialect (Darija). The accuracy and completeness of the anonymized transcripts were then verified. Data analysis was carried out using Nvivo-v.1.7.1 [30]. We used a hybrid thematic analysis approach [31] which integrated the data-driven inductive approach outlined by Boyatzis (1998) [25] and the deductive, a priori template of codes approach described by Crabtree and Miller (1999) [26].

This thematic process allowed us to work reflexively between the existing conceptual scaffold (the WHO BeSD model [24]) and remain theoretically informed while attending to emerging narratives. A codebook was developed and iteratively refined based on the emerging data through a collaborative process of reflection. Initial coding was conducted by OB, who set up the pre-defined BeSD domains and themes in NVivo. Regular discussions were held with SE to ensure coding reliability, researcher triangulation, interrogation of emergent interpretations, and fidelity to participants' meanings. We also engaged in peer discussions with PhD researchers working on migrant health across the MENA region, which further enriched our analysis through reflexive and contextual dialogue.

The study was reported using the Standards for Reporting Qualitative Research [32].

2.5. Ethical considerations

The study protocol was approved by the ethics committee of the University Hospital of the Faculty of Medicine and Pharmacy in Tangier Morocco (AV26MA/2023) and by the ethics committee of Hospital Clínic de Barcelona (HCB/2022/0655).

2.6. Reflexivity and positionality

All researchers involved in this study bring prior clinical, research, and personal experience working on migrant health issues. The first author (OB), a female Moroccan national who has a public health and clinical background. She is fluent in Arabic, French, and English, which helped in addressing language barriers during interviews. OB grew up in a stable household and country, with privileges such as access to higher education, learning languages, financial stability, all of which shaped her worldview. She acknowledges that these privileges may influence her interpretations and interactions. Senior authors (SH, SE, and ARM) bring diverse expertise, including transcultural psychiatry (SE), global health (MK, WC, BA, HC), and infectious diseases (ARM, FS). In addition, IT and CG have lived experience with migration to Morocco. Transcripts and analyses were extensively discussed between OB and SE during data analysis, as part of an international research project on migrant health in the MENA region. These discussions provided opportunities to reflect on codes, researcher positionality, and alternative interpretations of participants' quotes.

3. Results

3.1. Participant characteristics

We conducted 8 interviews with health professionals, 18 interviews and one FGD with 5 female migrant mothers. A total of eight health professionals and 23 migrant participants with diverse backgrounds were included in the study (Table 1). Overall, 15 (68.2 %) of the participants were female, the mean age was 30.0 years (SD = ± 2.00), the average length of stay in Morocco was 4.72 years (SD = ± 8.79), and 22/23 participants were from the WHO African Region whereas one participant was from the Eastern Mediterranean Region (Sudan). Regarding level of education, 16/23 participants had some level of education, and 17/23 were unemployed. 16/23 of participants were recruited in Rabat, 5/23 in Agadir and 2/23 in Oujda. The average ages across the three sites were similar (31.2 ± 11.1, 25 ± 5.22 and 28.8 ± 2.83 for Rabat, Agadir and Oujda, respectively). For health professionals, the majority were female, 3 were nurses, 3 were physicians and 2 were midwives. All interviews with health professionals were conducted in Moroccan dialect (Darija), whereas interviews with migrants were conducted in French ($N = 20$), English ($N = 2$), and Arabic ($N = 1$).

The findings are illustrated according to the broader domains in the adapted WHO BeSD model (Fig. 1), though the new themes that emerged reflect the lived realities of migrant participants, shaped by their interactions with the health system and vaccination services. Several non-pre-existing key themes were identified, including challenges related to legal and administrative barriers, interpersonal dynamics with healthcare providers, and gaps in the provision of information and guidance. The following sections will delve into these themes in more detail.

3.2. Individual processes: Thoughts and feelings about vaccines

3.2.1. Trust and confidence

Most migrant caregivers expressed confidence in the benefits and safety of childhood vaccination. They reported beliefs about the protective effect of vaccines against childhood infections and *"fever"* and mentioned that vaccines have limited risks compared to benefits. Some

Table 1
Sociodemographic characteristics of the study participants.

Characteristic	n (%)
Migrant participants (*N* = 23)	
Age in years, mean (SD)	30.0 ± 2.00
Sex	
Men	7 (31.8)
Women	15 (68.2)
Time of stay in Morocco (months), mean (SD)	47.2 ± 8.79
0–4	15 (65.2)
5–10	6 (26.1)
>10	1 (4.3)
Prefer not to disclose	1 (4.3)
Country of origin	
Ivory Coast	9 (39.1)
Guinea Conakry	6 (26.1)
Senegal	2 (8.7)
Cameroun	2 (8.7)
Central African Republic	1 (4.3)
Niger	1 (4.3)
Mali	1 (4.3)
Sudan	1 (4.3)
Education	
No schooling	6 (26.1)
Primary	3 (13.0)
Secondary	5 (21.7)
High school	6 (26.1)
Higher education	2 (8.7)
Prefer not to disclose	1 (4.3)
Employment status	
Employed	6 (26.1)
Unemployed	17 (73.9)
Administrative status	
Undocumented	2 (8.7)
Asylum seeker	2 (8.7)
Refugee	2 (8.7)
Passport	4 (17.4)
Prefer not to disclose	13 (56.5)
Primary health professionals (*N* = 8)	
Age in years, mean (SD)	41.4 ± 7.95
Sex	
Men	1 (12.5)
Women	7 (87.5)
Profession	
Nurse	3 (37.5)
Doctor	3 (37.5)
Midwife	2 (25.0)

participants also reported trust in health professionals because they are seen as "*accountable*" if something were to happen to the child. Only one of the migrant caregivers expressed concerns around potential harms from vaccines, such as "*paralysis of the arm*". Several migrant caregivers linked their trust in childhood vaccines to perceived familiarity and past experiences with vaccination in their home countries:

"Personally, for children's vaccines, we learned that the vaccine is important because we ourselves have had it. I myself was vaccinated so I had no issues. So, vaccinating my child, for me, is something I already have confidence in." FGD, Mother, 22 years old, Ivory Coast, Rabat.

When asked about COVID-19, some migrant participants—including those who had received the vaccine—expressed distrust in the safety and benefits of the COVID-19 vaccine, compared to childhood vaccination and other adult vaccinations such as tetanus. This was linked to misperceptions about the diseases, including scepticism related to the "*disproportionate*" attention garnered by COVID-19, and the misinformation surrounding the vaccine:

"Why aren't we talking about tetanus? Why don't we say that tetanus is bad? And why, when corona arises, the greatest researchers say don't do it, because if you do, you will have problems later giving birth ". IDI, Male, 28 years old, Ivory Coast, Rabat.

Distrust was also related to other rumours and conspiracy theories surrounding the disease and the vaccine, such as the belief that COVID-19 was "*an action led by Europeans*" or that COVID-19 vaccines were manufactured by the West to "*to destabilize Africa*". Only a few participants expressed trust in the benefits of the COVID-19 vaccine*: "This vaccine gave the rest of us protection"*. One participant also expressed the belief that nonpharmaceutical interventions (NPIs) (e.g. social distancing) were sufficient and that vaccines were not necessary for protection against the disease. Moreover, several participants expressed worries about perceived side effects of the COVID-19 vaccine such as the vaccine causing infertility, hypertension, dizziness, or fainting.

Having received the vaccine did not equate with trust in the vaccine benefits, particularly for some participants who had received it for practical reasons, such as travel, movement and work requirements. For instance, one participant, who had received the COVID-19 vaccine while incarcerated, connected the decision to get vaccinated with notions of limited "freedom" and constrained individual agency:

"Everyone [friends and acquaintances] refused [the vaccine], because those who are free do not get the vaccine."

3.2.2. Perceived disease risk and severity

Migrant caregivers reported that their decision to vaccinate their child was related to confidence in the health benefits of the vaccine and the risks of the child *"catching bad diseases"*, including *"a disease that causes paralysis"*. They believed that children get sick or get fever less often and contract less diseases when they get vaccinated.

Among participants who had taken the COVID-19 vaccine, the decision was also linked to a perceived high-risk of the disease and high perceived severity linked to witnessing close friends and family members die from COVID-19:

"As I already moved to Casablanca, I rubbed shoulders with a lot of people in the car, on the road, returning here. I felt a little strange. I did not feel well. So, I tried to go [get the vaccine]." IDI, Mother, 25 years old, Ivory Coast, Agadir.

3.2.3. Information about vaccines

For childhood vaccination, some migrant caregivers reported trust in the information available in the vaccination booklet and reported reading the booklet to learn more about vaccines. In addition, information on vaccines provided by family and friends was also seen as reliable:

"I like reading the vaccination booklet. Almost everything is written there […] you can find out a little about how things work and all that." IDI, Mother, 42 years old, Senegal, Rabat.

Regarding the COVID-19 vaccine, participants expressed general mistrust of information on TV and more trust in social media where the information was not *"censored"*. Some participants expressed trust in certain individuals, including "lawyers" and "prominent researchers," who were vocal on social media in opposing the COVID-19 vaccine mandate. One participant in particular explained that he only trusted "*leaders*", as in individuals he followed on social media, whom he believed shared his values:

"On social networks, everything is said [..]. on social media, it's people who speak from the heart." IDI, Male, 23 years old, Cameroun, Agadir.

Participants discussed how there was an abundance of information about the COVID-19 vaccine everywhere and in all media that has made them more sceptical about vaccines in general: *"Social networks make us slightly more suspicious" IDI, Male, 23 years old, Cameroon, Agadir.*

In contrast, one participant expressed confidence in the benefits of the COVID-19 vaccine and its potential to protect against the disease despite being surrounded by misinformation and explained others who distrust the vaccine due to circulating misinformation do not have 'critical thinking':

"I was not among those who were sceptical [about the vaccine]" - IDI, male, 44 years old, Cameroun, Rabat.

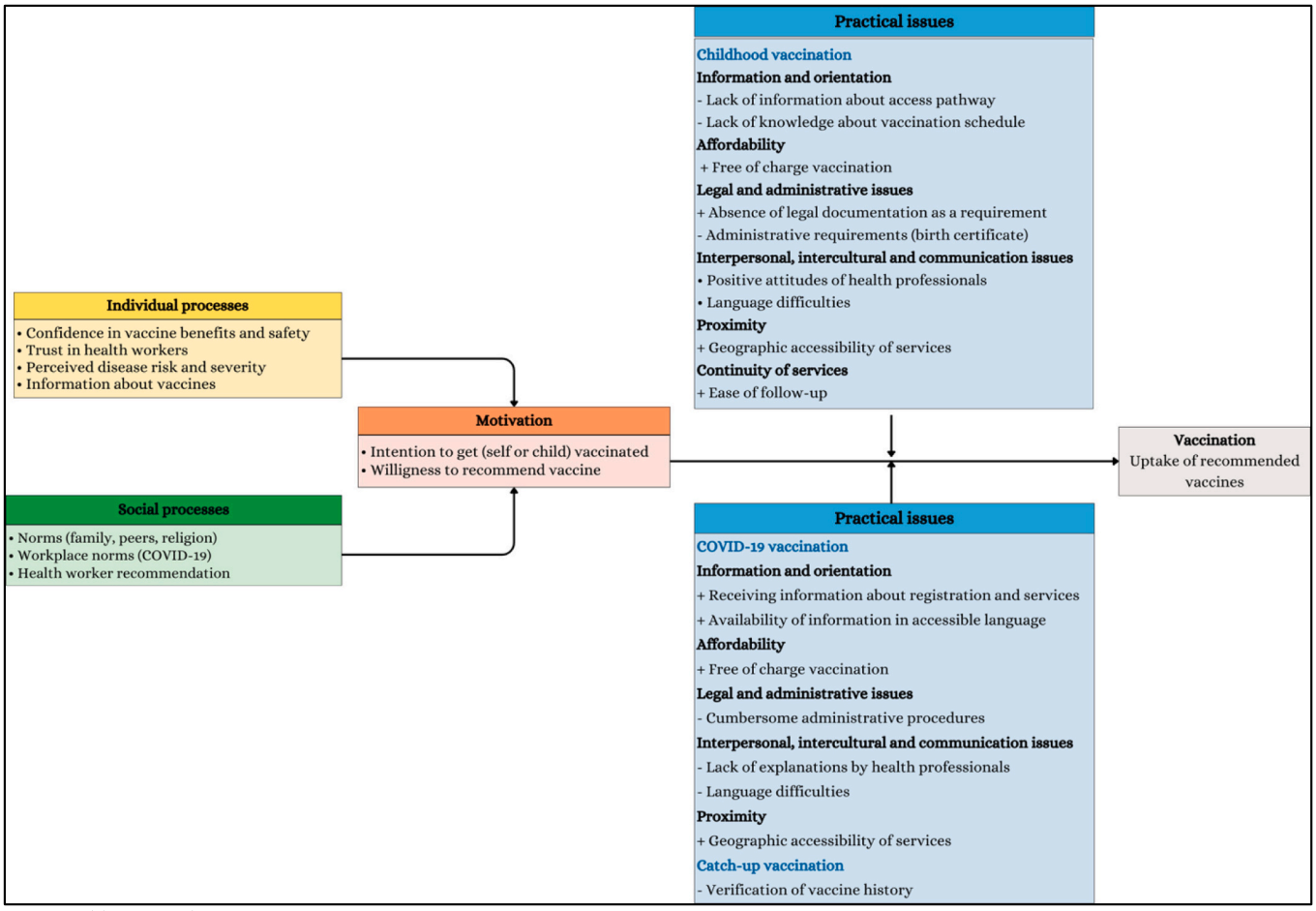

Fig. 1. Behavioural and social drivers of childhood and adult vaccination among migrants in Morocco. Adapted from Behavioural and social drivers of vaccination: tools and practical guidance for achieving high uptake. WHO. 2022.

3.3. Social processes and norms around vaccination

3.3.1. Family, peer, workplace, and religious norms

Migrant caregivers reported that the encouragement of friends and family norms in their country of origin has shaped their decision to vaccinate their children. They also reported they are familiar with the experience of getting vaccinated and are aware that 'nothing happens' and no side effects occur post-vaccination when they recollect their personal experiences and those of children in their extended families back home:

"For children, we say even in families in Senegal, we must be vaccinated, so why not vaccinate the child? it's for health." IDI, Mother, 42 years old, Senegal, Rabat.

For the COVID-19 vaccine, participants reported that positive family norms (i.e., the willingness of family members to receive the vaccine), social pressure, the need to conform, drove them to accept and receive the COVID-19 vaccine:

"Before, people believed [that the vaccine was not safe], but when I saw my husband and my sister did it, I realized that it's false." IDI, Female, 30 years old, Mali, Oujda.

COVID-19 vaccination employer requirements also drove many migrant participants and their peers, especially those working in agricultural sectors and migrant women working as babysitters ("*nounou*") with host families, to get vaccinated. However, different workplace norms also deterred some participants from receiving the COVID-19 vaccine. For participants whose employer did not require them to get vaccinated or was outwardly against getting vaccinated, participants explained that they did not feel the pressure or motivation to get vaccinated:

"It was required for those who worked. They were told, 'You have to do it.' Even being a servant, a nanny, they tell you that you must get the shot. So, I had sisters, friends who didn't want to, but they were forced to so as not to lose their jobs." IDI, Female, 57 years old, Ivory Coast, Rabat.

"If your boss doesn't take a dose, it's not the employees who will take a dose, that's not possible » IDI, Male, 23 years old, Cameroon, Agadir.

Religious beliefs and practices also influenced the decision to get the COVID-19 vaccination as they were perceived to have a protective against against the disease. For instance, one participant believed that prayers could protect against disease, leading her to not consider receiving the COVID-19 vaccine:

"I didn't think about that [getting vaccinated], because it's always about praying. When you pray you can't get sick, you are always healthy." IDI, Female, 23 years old, Guinea Conakry, Agadir.

3.3.2. Health worker recommendation

Whereas most migrant caregivers were recommended to vaccinate their children after giving birth by health professionals, most migrants mentioned not being offered any adult vaccines (other than COVID-19) since they arrived in Morocco. Similarly, all health professionals described adult vaccination as rare and expressed that often they do not inquire about or are not aware of the need for adult catch-up vaccination irrespective of migrant status:

"In adults, it's very rare, it's very rare. But for children, yes." Doctor, Female, 52 years old, Rabat.

Vaccines were only recommended and offered to adult migrants in the case of COVID-19 and in the case of the tetanus vaccine for pregnant women during prenatal care visits which is part of the national immunization schedule. Migrant mothers described that the tetanus vaccine were provided free of charge:

"When I went to the hospital, they said it's mandatory, a pregnant woman must have the [tetanus] vaccine. So, I did it. "IDI, Mother, 35 years old, Ivory Coast, Agadir.

3.4. Motivation

When examining motivation—driven by feelings, emotions, social norms, and processes—migrant participants who did not already receive the COVID-19 vaccine expressed unwillingness to receive the vaccine. One participant in particular, expressed refusal to receive COVID-19 unless it became a requirement to return to her country of origin and expressed that she would continue to refuse the vaccine, as long as it is not a requirement to stay in the country:

"They asked me to go get the Corona vaccine. I refused. I said maybe if I have to go to the country, and that requires me to get the vaccine before returning, then I'm going to do it. But for the moment, in Morocco, I refused." IDI, Female, 48 years old, Ivory Coast, Rabat.

All migrant caregivers expressed a willingness to vaccinate or continue vaccinating their children. Although, this was linked to both health reasons (benefit for the child) and practical non-health-related reasons, such as potential travel to Europe or returning home. Some migrant participants also emphasized that complete vaccination records for their children were an administrative requirement to regularize their children's status and ensure their integration into services such as schooling. This also served as a motivation for some migrant mothers in this study to vaccinate their children:

" I will encounter problems if I don't vaccinate my children, and I may have problems even if I don't go to France. One day I might decide to return to Mali. At the airport, they could ask me for my child's vaccination card."- IDI, Female, 30 years old, Mali, Oujda.

In addition to continuing to vaccinate one's own children, some migrant participants also expressed a willingness to recommend vaccines to other caregivers due to the perceived health benefits of the vaccines:

"If I know [people who refuse to vaccinate their children], I will tell them to give their children vaccines to avoid diseases." IDI, Mother, 30 years old, Guinea Conakry, Agadir.

3.5. Practical accessibility issues

3.5.1. Childhood vaccination

Migrant participants and health professionals reported several practical accessibility issues experienced by caregivers in vaccination services. A key theme emerging from participant narratives was insufficient information and orientation manifesting in caregivers' lack of knowledge about the vaccination pathway and procedure, especially for first-time access, often leading to presenting without appropriate documents and making multiple trips to the health center. One participant also expressed frustration about having to make multiple trips between the health center and her home while carrying her child because the necessary information about which documents to bring was not provided all at once. In addition, health professionals noted that migrant caregivers were often unfamiliar with Morocco's vaccination schedule and often compared it to their home country's calendar:

"The first time I didn't know anything." IDI, Mother, 33 years old, Guinee Conakry, Rabat.

"At the beginning they don't know the protocol to follow, when they come, they compare it with their country of origin" Nurse, Female, 43 years old, Rabat.

Overall, migrant caregivers were satisfied with health professionals' attitudes, interactions with children, and explanations about vaccines and target diseases given during vaccination sessions. When discussing the vaccination sessions, migrant parents expressed satisfaction with nurses who were described as 'kind' and often take the time play with the children and distract them from the needle. However, some participants reported experiencing difficulties interacting with other health personnel (e.g., reception) in the waiting room due to language difficulties:

"Especially the one [nurse] who vaccinates my son, she is so nice, she makes poses, she plays with the child to distract him." FGD, Mother, 22 years old, Ivory Coast, Rabat.

"There are also difficulties that we encounter there because there are those [migrants] who don't understand Arabic »." IDI, Mother, 33 years old, Guinee Conakry, Rabat.

Migrants described good continuity and organization of services regarding follow-up on missed appointments and reported that once they missed appointments, they were aware of the days where vaccination took place and were able to catch up the week afterwards. However, some participants reported moving to a different city, which resulted in delays in seeking vaccination services, often due to unfamiliarity with the new primary care centers. In addition, health professionals also mentioned that they ensure follow-up by giving appointments even for newly introduced vaccines which are set to be administered later in life, such as HPV:

"HPV has just been introduced, age 11, when the Moroccans or migrants come, when I give the 5-year-old vaccine, I make an appointment for 11-years-old for HPV." Midwife, Female, 36 years old, Rabat.

All migrant caregivers mentioned that regular administrative status in the country was not a requirement to vaccinate their children, and that vaccines were provided free of charge in health centers in the catchment areas where they lived. Migrant mothers noted that, in health centers, they are often not required to present proof of regular administrative status. However, they may be asked to provide an identity document (even if expired) and/or proof of address to confirm they reside within the catchment area. Proof of address posed a challenge for some migrant participants, particularly those living in shared accommodations where the apartment was not in their name or those experiencing tensions with landlords, making it difficult to obtain the document. Nonetheless, health professionals explained that vaccination was not refused and that they often find ways to address and resolve these situations. One nurse expressed a strong sense of responsibility, emphasizing her belief that if she were to let the child leave without vaccination, the child might remain unvaccinated:

"They don't ask for [the documents], they ask if the child is sick; if they have a fever, if they don't have any illness, then they will give the child the vaccine." IDI, Mother, 29 years old, Niger, Rabat.

"Everyone, every child who comes, as long as they live in the perimeter; they [caregivers] register, they come back with a vaccine booklet, and we give him [the child] vaccination, according to the protocol of the national immunization program." Doctor, Male, 52 years old, Rabat.

Although having a regular administrative situation was not a requirement, health professionals reported that a birth certificate was necessary to provide vaccination. They highlighted challenges in vaccinating children whose mothers did not give birth in a hospital or who delivered at home. Some migrant mothers also expressed difficulties in obtaining their child's birth certificate, explaining that giving birth in a hospital was not free of charge and that obtaining the birth certificate was contingent on paying the delivery fees. In some cases, migrant caregivers misunderstood that they were paying for the birth certificate rather than the delivery itself. Some migrant participants, unable to afford this cost, sought support from local organizations to cover the expenses associated with delivery. Health professionals noted that, in the majority of cases, children attending vaccination services were born in the country and typically came with a birth certificate:

"They cannot come without a birth certificate because they must have given birth in an attended environment, otherwise they will not come, no one will give them [a document] that she gave birth at home." Midwife, Female,

34 years old, Rabat.

3.5.2. COVID-19 vaccination

Migrant participants who received the COVID-19 vaccine reported having received information and awareness-raising sessions about the vaccine from local authorities and health professionals in their neighbourhood and community, often in their own language:

"There were people who put up the tents, people in blouses explain to you; you go here, you register, you do this, you do that." IDI, Female, 57 years old, Ivory Coast, Rabat.

All migrants reported that the vaccine was provided free of charge and in proximity areas *"in each* neighbourhood" or in the health centre in the catchment area. However, they have reported communication issues such as health professionals not taking the time to explain the benefits of the vaccine or how it works. In addition, health professionals also reported language difficulties as a challenge experienced during the COVID-19 vaccination campaign:

"They tell us nothing, we only have to inject ourselves, they don't explain to us why we have to inject ourselves. » IDI, Male, 23 years old, Cameroun, Agadir.

"If he [migrant] speaks French it's fine we can [communicate], but if he only speaks English or his language, we find problems, we can make an effort, but it's an obstacle, I see it as an obstacle, even during COVID -19, we found this problem." Nurse, Female, 43 years old, Rabat.

Another key emerging theme not reflected in the WHO COVID-19 BeSD model is administrative issues in accessing COVID-19 vaccination. Participants explained that registering to receive the vaccine was conditioned by having a valid identity number, which had to be entered into the online vaccination system in order for them to receive the vaccine. However, it was explained that this was later amended by the authorities who have put in place additional administrative procedures to circumvent this issue. Nevertheless, the cumbersome administrative procedure was described as discouraging and led some migrants to not receive the vaccine:

"We are told to go there to fill out the files before coming here. So, for me, it was a bit much. It was a bit of a lot of time that I got discouraged and left." IDI, Female, 30 years old, Mali, Oujda.

3.5.3. Catch-up vaccination

For child catch-up vaccination, health professionals mentioned that the majority of migrants who come to vaccination are those whose children were born in Morocco and that *"those who come to complete are rare"*. For children born outside the country, this was described as a rare occurrence. However, if vaccination records were available, one primary care physician explained that they would cross-reference them with the national vaccination calendar to ensure completion:

"Sometimes if she [a migrant woman] gave birth to her baby there [in the country of origin] before coming, we resort to the paediatrician, to compare our calendar with theirs, what she received, what she didn't receive, and she comes back to complete, in alignment with our calendar... she comes with her [vaccine record], shows us this is what she did and we call on the paediatrician and complete with what we have in our calendar,"- Nurse, Female, 43 years old, Rabat.

For adult migrants, the verification of vaccination status is often not done by health professionals, and participants were often not aware of the need for adult catch-up:

"We do not ask, because the vaccination age is up to 5 years, and women of childbearing age are tetanus." (*Midwife, Female, 36 years old, Rabat)*.

The only exception was the case of tetanus vaccination for pregnant women, which is offered to women already in prenatal care. In addition, health professionals described that during childhood vaccination sessions, they would seize the opportunity to ask the mother whether she had received the tetanus vaccination in her home country and provide it if she had not:

"Yes, pregnant women during the antenatal care visits are given tetanus, we offer tetanus, if she has not done it in her country. If we do not see her in antenatal care visits, when she comes with her baby, we ask her if she is vaccinated against tetanus." Midwife, Female, 36 years old, Rabat.

3.6. Recommendations to improving vaccine uptake

When asking migrants and health professionals for recommendations to improve access to vaccination services, migrants expressed a need for improved interpersonal communication with health professionals and the importance of addressing language barriers:

"This is how I see what we can improve, it is the reception and the dialogue between people. The French accent is different sometimes. So, if you arrive somewhere, you find the person, they're not friendly and sometimes that complicates things. You have to know how to interact with staff like that." - IDI, Female, 42 years old, Senegal, Rabat.

Additionally, some participants mentioned the need for sensitization to address scepticism and hesitancy regarding vaccination among migrants:

"They [some migrants] do not want to be vaccinated at all and we just need to make them aware…we need to get them to understand the importance of the vaccine." IDI, Male, 44 years old, Cameroun, Rabat.

Recommendations also included increasing the information on where services are located for migrant communities by enhancing the availability of community-based organizations (CBOs) and conducting outreach for migrants living in secluded areas who may not seek services due to fear. This is especially those who have just entered the countries and do not know how to reach CBOs. It was also discussed that these are hard-to-reach groups that need integrated care beyond vaccination and addressing basic social and essential needs:

" In terms of access [to vaccination]…first you have to pay the price of transport, you have to take care of them and everything, to have access to these people [migrants in hard-to-reach areas], to these children. Otherwise, they have something else in mind, maybe they are thinking about crossing [the borders]. Maybe they don't care about vaccination at all. But you have to make them aware. They also need the little things first, they need the amenities [Food, shelter], they need the means. They are lacking resources. " IDI, Male, 44 years old, Cameroun, Rabat.

4. Discussion

The aim of this study was to explore the factors driving uptake of childhood and adult vaccination among migrants in Morocco guided by the WHO BeSD framework and to adapt it based on contextual insights. We found that migrant children and adults were entitled to free-of-charge vaccinations, but persistent individual and social processes and practical issues were driving motivation and uptake. For childhood vaccination, there was high confidence in vaccine benefits and safety among caregivers, and language issues were reported by migrant caregivers and health professionals alike. Administrative difficulties (e.g., obtaining birth certificates) and limited information and orientation, also emerged as key drivers of uptake which were not initially reflected in the original BeSD model. For adult vaccination, we found mistrust and scepticism toward specific vaccines, particularly the COVID-19 vaccine, mainly due to rumours and misinformation. With the exception of the tetanus vaccine for pregnant women and the COVID-19 vaccine, migrant adults did not mention being offered any other adult or catch-up vaccinations, often due to absence of health worker recommendation (for adult vaccines in general, irrespective of being a migrant) and the non-verification of vaccine history for catch-up vaccination. Migrants emphasized the need for better interpersonal communication with health professionals and addressing language barriers, and a need for sensitization to reduce scepticism and hesitancy about vaccines. In addition, they also recommended increasing information on service locations particularly through CBOs, and conducting outreach for secluded migrant communities to provide vaccination services and simultaneously address their broader social and essential needs. These findings may have significant implications for several countries in the

Maghreb and the wider MENA region, where similar policies for vaccination access for migrant groups exist, and where similar factors have been shown to drive low coverage and uptake of important routine vaccines and doses [19]. In addition, the adapted BeSD framework is a key research output that may be used to analyse on a broader scale, drivers of uptake for specific vaccines in migrant groups and specific subgroups in Morocco and similar contexts, including adolescent and adult catch-up vaccination, and newly introduced vaccines (e.g. HPV). It can also be used to guide interventions geared toward promoting vaccination uptake in this group.

Offering vaccination services across the life course is key to increasing coverage for routine vaccination services for under-vaccinated groups such as migrant children, who may have differential access, and adult migrants, who may have missed doses in the primary series during childhood in their home countries. Understanding these factors is crucial for designing, vaccination programs, services and interventions which are migrant-sensitive and which target the identified drivers of non-uptake; in order to bridge the gap between policy intent and demand and uptake for vaccination services by migrants across the life-course, as migrants may opt out of utilizing services despite entitlements due to various social and contextual factors [23].

Despite entitlement to free vaccines for migrants, the literature from European and non-European Mediterranean countries reveals that access barriers such as language difficulties and lack of information and orientation about services persist [33]. This finding fits with our results showing that although being documented was not a requirement for accessing childhood and adult vaccinations (e.g., COVID-19, tetanus) and vaccines were provided free of charge in primary care facilities, several persistent accessibility issues were reported. These factors may affect access to services for migrant groups and lead to missed doses or non-uptake of recommended vaccines [23]. Our findings align with those of a national survey conducted in 2022 by the Ministry of Health and Social Protection in Morocco, which showed that less than 50 % of migrants were aware of their entitlement to free health and vaccination services [34]. Similarly, a global systematic review on the drivers of vaccine uptake indicated that perceived non-entitlement may be a key driver of under-vaccination among migrant groups globally [10].

Another practical access issue reported by caregivers in this study, which was not initially reflected in the original BeSD model, was administrative difficulties, such as obtaining birth certificates. Health professionals noted that non-hospital and non-assisted births might present a barrier to starting vaccination for children born in and outside the country. This finding is consistent with results from a nationwide survey in Morocco showing that 98 % of 1721 migrant women who gave birth in a public hospital or birthing centres vaccinated their children according to the national EPI schedule [34]. This finding also aligns with studies in other countries. For example, research among socioeconomically disadvantaged migrants in India showed that hospital births and the possession of birth certificates by caregivers were associated with a greater likelihood of vaccine completion among children [35,36]. This suggests that vaccine uptake might also depend on pregnant mothers' access to prenatal and postnatal care, which increases opportunities for providing information about childhood vaccination and services. In other MENA countries, such as Lebanon, Iraq and Sudan, a regional systematic review revealed similar accessibility issues, such as communication and information barriers, were also reported among migrant groups; however, other distinct barriers, such as limited availability of staff and vaccine stockouts, were significant barriers to vaccination or completion of vaccination [37–40], which was not found to be a factor driving uptake in the present study. This may be due to the protracted conflicts experienced by these countries leading to disruption of the supply of vaccination services. Addressing these practical barriers is vital to ensure that migrants' experiences with services do not affect the continuity of vaccination services, as previous negative experiences in services provided by host country health services have been shown to decrease the acceptance of vaccines [12]. This is particularly important for vaccines administered in adolescence, such as HPV vaccines and adult vaccination.

Another main finding was that migrant caregivers generally had high confidence in childhood vaccinations, which they attributed to their familiarity and past experiences with these vaccines, as well as recommendations from healthcare providers. This is consistent with findings from studies in New Zealand [41,42] and Canada reporting trust and overall willingness of migrant caregivers to vaccinate their children [43]. However, contrasting views were expressed regarding specific vaccines, such as the COVID-19 vaccine, despite recommendations from healthcare workers. These results align with studies in the literature showing that the perceived novelty of 'new' vaccines influence uptake among migrants. This was reported extensively for COVID-19 [44], as well as newly-introduced vaccines such as HPV [45]. In this study, some participants expressed hesitancy or outright refusal toward the COVID-19 vaccine, while others complied due to practical requirements, despite not being fully convinced of its benefits and despite being surrounded by misinformation. This is also corroborated by previous research on vaccine hesitancy showing that views about vaccination do not always correlate with uptake or refusal [46]. A potential explanation for these differences posited by studies among both migrant and host populations may be that individuals who prioritize moral intuitions such as liberty and sanctity tend to value access to information before vaccinating, whereas those who lean toward authority as a moral intuition are more likely to trust recommendations from trusted sources [47,48].

Importantly, we found limited knowledge of adult vaccination and catch-up vaccination among both migrant participants and health professionals, resulting in adult migrants not being offered any vaccines, except for pregnancy vaccinations (in accordance with Morocco's EPI schedule which also includes Influenza vaccination for high-risk groups) and COVID-19 vaccines. This finding is consistent with another study among adult migrants in the UK, where very few participants mentioned being offered catch-up vaccines, except for travel-related and pregnancy vaccinations upon arrival, despite the availability of national guidelines [47]. In the host population, one study among pregnant women who were unvaccinated against H1N1 in Morocco also revealed that unvaccinated women also did not have any prior knowledge of the vaccine [49]. In Morocco and in the majority of countries in the MENA region there is a strong focus on childhood vaccination, and this program is consolidated and has achieved coverage levels as high as 90 % for all vaccines in the schedule, whereas vaccination programs for adults remain limited. For example, despite growing interest and investment in influenza vaccination for high-risk groups, uptake is estimated to be low in the general population [50]. While there is limited research exploring barriers to adult vaccination even among the host population in Morocco, some research has suggested challenges such as a lack of recommendations by health professionals, missed opportunities to recommend or administer vaccines during outpatient care, insufficient training of health professionals in adult vaccination, the high cost of some vaccines, and overall low awareness in the general population, leading to low demand [51,52]. Most of these issues were echoed by migrants and health professionals in this study and it is likely they affect access to adult vaccination, compounded by specific practical access issues reported in this study. Regarding catch-up vaccination, we found limited knowledge and a lack of verification of vaccination status of adult migrants among health professionals. This finding is consistent with studies in primary settings in the UK, which showed that potential inhibitors for catch-up vaccination included insufficient training and knowledge among staff, in addition to a lack of incentivization, although the latter was not reported in this study. Thus, it is important to strengthen training and raise awareness among health professionals to ensure the verification of the vaccination status of migrants of all ages and to support catch-up vaccination, as well as the implementation of innovative strategies such as shared decision-making processes in adult vaccination, which have been shown to improve vaccine acceptance [53].

Migrants in this study highlighted several critical areas for improvement such as the need to improve communication with health professionals by removing language barriers. This could involve providing translation or interpretation services, multilingual health information materials, and training health professionals on cultural competence and effective communication strategies. Additionally, there is a strong call for increased investment in CBOs as these organizations play a pivotal role in bridging the gap between migrants and healthcare services by offering tailored information about access pathways to vaccination services in the host country. Certain migrant groups may be particularly hard to reach due to factors such as geographical location and socio-economic barriers. For these groups, participants recommended tailored delivery and outreach strategies combined with efforts to address broader social needs. For adult and catch-up vaccination, clear guidelines and policies are needed to ensure the verification of vaccine status by health professionals. Efforts are required to train professionals and raise their awareness to check vaccination histories and offer adult and catch-up vaccines in an opportunistic manner, in primary care settings and through innovative community approaches. These guidelines should be matched with efforts to deliver culturally sensitive information to eligible migrants and to work in collaboration with communities to address concerns and build trust.

While this study addresses important gaps in the evidence base on what drives uptake of childhood, adult and catch-up vaccination in migrants in Morocco, it has some limitations. Participants were recruited only through CBOs and NGOs often situated in well-served areas, which may have resulted in missing a significant proportion of migrants residing in remote regions of Morocco and who may not be served by or well connected to CBOs and NGO networks. All caregivers recruited in this study had children born in Morocco, in public healthcare facilities. However, an extensive body of literature highlights the influence of parent–child nativity on vaccination uptake in migrants. Multiple studies suggest that first-generation migrants generally have higher vaccination uptake compared to second-generation migrants [54–56], although these differences may diminish when considering timeliness of vaccination [57] or may be explained by differences in socioeconomic status. Further research is needed to investigate differences drivers of vaccination uptake in migrant children born outside Morocco. A final limitation in this study is that primary care professionals were recruited exclusively in Rabat due to time constraints and the need to secure administrative approval within the study timeframe.

In conclusion, we have identified a range of individual, social, and practical issues affecting the uptake of routine and adult vaccination among migrants in Morocco which should be targeted to drive demand and uptake of vaccination across the life-course. These findings may also be relevant to the Maghreb countries and the broader MENA region and should be considered to address the gap between entitlement to vaccination services and demand and uptake for migrant groups across the life course, which is key to reaching global immunization targets.

CRediT authorship contribution statement

Oumnia Bouaddi: Writing – review & editing, Writing – original draft, Visualization, Validation, Investigation, Formal analysis, Data curation, Conceptualization. **Mohamed Khalis:** Writing – review & editing, Supervision, Investigation, Conceptualization. **Moudrike Abdellatifi:** Investigation. **Farah Seedat:** Writing – review & editing, Investigation. **Anna Deal:** Writing – review & editing, Investigation. **Wafa Chemao-Elfihri:** Writing – review & editing, Investigation, Conceptualization. **Bouchra Assarag:** Writing – review & editing, Investigation, Conceptualization. **Hassan Chrifi:** Writing – review & editing, Investigation, Conceptualization. **Nelly Chavassieux:** Writing – review & editing, Investigation. **Ibrahim M. Sorie Turay:** Investigation. **Cédric Kané Gohi:** Investigation. **Tarik Oufkir:** Writing – review & editing, Investigation. **Ana-Requena Méndez:** Writing – review & editing, Supervision, Investigation, Conceptualization. **Sally Hargreaves:** Writing – review & editing, Supervision, Investigation, Conceptualization. **Stella Evangelidou:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Conceptualization.

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Appendix A. Supplementary data

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Data availability

The data may be made available upon reasonable request.

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