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Exploring barriers and facilitators to physical activity participation and food security among the Rohingya community living in Australia: a socio-ecological perspective

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Abstract

Introduction Many Rohingya people from Myanmar have sought refuge and resettled in Australia due to persecution and genocide. Like many people from refugee and asylum seeker backgrounds who resettle in Australia, the Rohingya community face significant mental, physical and psychosocial challenges. Physical activity and nutrition are interrelated, modifiable risk factors associated with a range of health and psychosocial outcomes. Therefore, this study aimed to explore barriers and facilitators to physical activity and food security among the Rohingya community who have resettled in Sydney, Australia to inform intervention development.

Methods In-depth interviews and focus groups with Rohingya community leaders and members were conducted. Community leaders were identified as individuals from the same community who have lived experience of displacement and advocate for the community's needs. Reflexive thematic analysis and framework analysis were used to identify and then allocate themes to theoretically-driven domains according to the socio-ecological model.

Results In total, sixteen participants were interviewed, including *n*=7 via one-one-one interviews and *n*=9 via a focus group. Of the 16 participants, five were community leaders. Ten themes for physical activity and twelve themes for food security were identified and mapped onto the socio-ecological model. The impact of insecure visa status was identified as a significant macro-level barrier affecting both physical activity and food security. Lack of culturally responsive services and increased barriers to physical activity for women due to cultural expectations and gender roles were also identified. However, increased opportunities to engage in healthy lifestyles in Australia compared to Myanmar, social support and physical and mental health benefits as motivating factors were discussed as key facilitators.

Conclusion Health promotion efforts targeting physical activity and food security require a multifactorial approach which prioritises cultural sensitivity, acknowledges gender roles and expectations, and considers past experiences including the impacts of migration.

Keywords Physical activity, Exercise, Food security, Rohingya community, Refugee, Barriers, Facilitators, Socio-ecological model

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Introduction

The Rohingya people are an ethnic minority group from Myanmar (formally Burma), who are among the most persecuted people in the world [1]. Rohingya people have experienced decades of statelessness, forced displacement, systematic racism, abuse and targeted violence [2]. Over one million Rohingya refugees have fled Myanmar since the early 1990s [1]. Many have been forced to reside in refugee camps in neighbouring Bangladesh, often for extended periods, while others have resettled in high income countries including Australia. More than 20,000 Rohingya have arrived in Australia since 2006 [3].

Refugee resettlement is associated with a range of mental, physical and psychosocial consequences due to both pre- and post-migration stressors [4]. In the settlement environment, a combination of socioeconomic, social, and interpersonal factors, as well as factors associated with the immigration and asylum process and policy can affect the psychological functioning of refugees [5]. These factors lead to increased risk of preventable health problems such as cardiovascular and metabolic diseases [6]. Physical activity and nutrition are interrelated, modifiable risk factors associated with both health and psychosocial outcomes [7]. These health behaviours often cluster or co-occur [8], contributing to health problems among refugees [9]. Interventions targeting multiple health outcomes (e.g., diet, physical activity, sedentary behaviour) can result in better health outcomes [10].

Among refugees and asylum seekers, there is growing evidence demonstrating that sport and physical activity can contribute to psychosocial outcomes [11–13]. Suggested mental health promoting pathways/mechanisms for leisure-time activity include enhanced self-agency, resilience, social connectedness and minimised risky behaviours [14]. Despite the benefits, evidence shows that people from refugee and asylum seeker backgrounds engage in low levels of physical activity and are often excluded from physical activity promotion interventions [15, 16]. Participating in physical activity has been identified as a strategy to manage psychological distress and trauma by the Rohingya community living in Bangladeshi refugee camps [17]. Although supported by community leaders, barriers to participating in physical activity were identified, including a lack of resources, access for those that are older or disabled and security fears and cultural attitudes regarding women's participation [17]. While findings from camp settings such as cultural attitudes, may be transferable, resettlement contexts such as Australia present unique challenges that must be explored [4].

In addition to physical activity, access to adequate food is arguably a human right and critical for wellbeing [18]. Food security is defined as consistent access to sufficient and safe food to meet dietary and food preferences, and nutritional requirements [19, 20]. Food security is often viewed through four pillars: i) availability, ii) access, iii) food use, and iv) stability (of the aforementioned pillars over time) [21]. Refugee populations are particularly vulnerable to food insecurity. In Australia, prevalence rates have varied from 35% to 90% for refugee populations, with between 11% and 40% experiencing severe hunger [22]. This is in stark contrast to the 4% of the general population in 2011 who reported food insecurity, though estimates since the COVID-19 pandemic have increased [23]. Poor mental health including stress, anxiety, depression and social isolation, as well as systemic barriers such as financial constraints, acculturation difficulties and language barriers can all affect food security [22, 24–28]. These factors may impact diet quality, malnutrition, nutrient deficiencies and contribute to chronic disease such as diabetes, psychological distress and suicidal ideation [29–31]. The relationship between food security and mental health is likely to be bidirectional or cyclical among refugees, whereby poor mental health can lead to food insecurity via pathways such as helplessness, low motivation, and being compelled to eat culturally inappropriate foods [32, 33].

Evidence supports the ethical and functional importance of community engagement in the development of health promotion efforts among refugee populations including the Rohingya community [34, 35]. For example, a previous health promotion effort targeting the Rohingya community in Australia supported the community to address a health priority, as chosen by the community themselves [36]. The Rohingya community chose to target mental health though social connection and were supported to lead events, including a football (soccer) tournament and a picnic day. These events successfully enabled community empowerment, promoted social connection, built capacity in a community welfare organisation and allowed for reflective practice and learnings [36]. Further, while it is generally acknowledged that refugee populations in Australia are at high risk for food insecurity, a recent review did not identify any studies that specifically explored the challenges in achieving the dimensions of food insecurity in the Rohingya community [22].

Despite increasing recognition of the important role of physical activity and nutrition in the health of refugees, there is limited research investigating the factors influencing these health behaviours. Therefore, this study aimed to gain a deep understanding of the barriers and facilitators to physical activity and food security to inform the development of health interventions for the Rohingya community living in Australia.

This study was conducted under the ethical guidelines of the Helsinki Declaration of 1975, and approval was granted by the South West Sydney Local Health District (2021/ETH01115) and University of New South Wales (2021/ETH01115 External Human Research Ethics Approval) prior to recruitment and all participants provided informed consent. Given the unique circumstances of the participant group including language barriers, and potential concerns regarding written agreements, verbal consent was sought from all study participants, rather than written consent. The participant information statement was reviewed and verbally translated by an interpreter or community leader as needed. Following this, the community leader or researcher, with the assistance of an interpreter, confirmed that participants understood who the research team were, the aims of the research, and how the data would be used, before obtaining verbal consent. The paper is reported in accordance with the Consolidated Criteria for Reporting Qualitative Research (COREQ), which can be found in the supplementary materials [37].

Participants and recruitment

Participants were eligible for inclusion if they were aged over 18 years and a part of the Rohingya diaspora in Sydney. Participants were recruited through existing links with community leaders. Snowball sampling was used to recruit participants via a community organisation (The Burmese Rohingya Association of Australia). Snowball sampling is the most appropriate recruitment method for this research, as people from refugee backgrounds, including the Rohingya, are often hard-to-reach groups for academic research. In addition, this method builds upon trust and rapport, and aims to promote cultural sensitivity. Participants were reimbursed for their time with a gift card.

Seven participants joined a 30–45 minute semi-structured interview and nine participants joined a 1 hour focus group via a Zoom video call or in person, depending on participant preference. Participants were given the option to have a Bilingual community leader present in the interview if they required interpretation. Interviews were conducted by members of the research team with experience in physical activity or food security and nutrition (SR, GM, DW, EL, CM). The focus group was co-led by a community leader and a member of the research team (SR).

Procedures

A community engagement approach was utilised [38]. This involved conducting initial interviews with community leaders and employing an iterative approach to gain feedback on the interview guide and ensure that the content and wording was appropriate before implementation of the interview schedule in subsequent interviews with community members. Physical activity questions asked participants about the meaning of the term (including the different domains of activity), their personal experiences engaging in physical activity, changes to physical activity levels and barriers and facilitators to physical activity. They were also asked about the four pillars of food security, including food availability, food access, food utilisation and food stability [39]. The interview schedule can be found in the Supplementary Materials. Interviews were audio recorded, transcribed verbatim, removing identifying information, and uploaded to NVivo12 (QSR International, Melbourne, Australia) for analysis.

Analysis

Reflexive thematic analysis was conducted using Braun and Clarke's method [40]. Step 1 of *familiarisation* with the data involved reading transcripts multiple times and taking notes about initial thoughts. Step 2, *generation of codes*, includes coding all data systematically based on initial perceptions. Step 3 requires researchers (GM and CM) to collate these codes to form potential *themes*. Step 4, *reviewing themes* and deductively mapping them to the existing socio-ecological framework. *Defining and naming themes* is next and refers to the ongoing analysis where authors refine themes and finalising theme names. The last step, *producing the report* involves writing a report of the findings based on the research aims, and reviewing all analyses for the final time. The initial analysis was presented back to members of the Rohingya community who assisted with the interpretation. Themes were reviewed and deductively mapped onto an existing socio-ecological framework which looks at health as affected by the relationship between intrapersonal, interpersonal, community and macro level factors [41–43]. The macro-level concerns policies that may directly or indirectly affect health behaviours and the community level relates to the community and cultural environments like community cohesion or socioeconomic status [44]. The interpersonal or social environment focuses on aspects such as social norms and support, while intrapersonal factors are characteristics of the individual such as age and gender [44].

Reflexivity

The interviews and focus groups for this study were conducted by GM, CM, SR, DW and EL. GM and CM are female researchers with previous experience in qualitative research related to physical activity and mental health. GM acknowledges the potential for her own cultural and social biases to influence the research process,

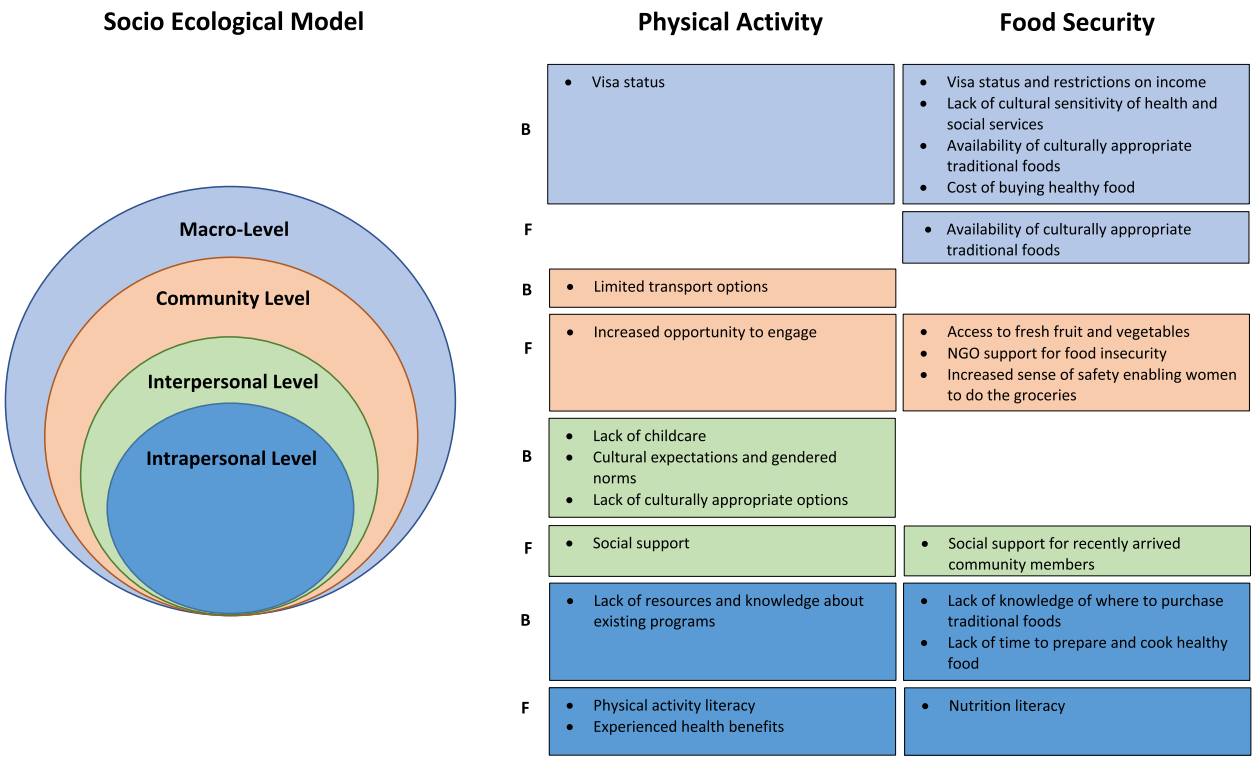

Fig. 1 Theme results deductively mapped to the Social Ecological Model's macro-level, community level, interpersonal level, intrapersonal level. Adapted from Story et al 2008 [45] and Mahmood et al 2022 [44]

given her Anglo-Celtic background. CM recognises her experience and family heritage does not involve forcible displacement and the effect that this may have on her personal biases. DW and EL are female public health professionals with a background in nutrition and experience working with refugee communities. SR is a male researcher with previous experience in qualitative research focusing on physical activity, mental health and displaced communities. The authors acknowledge that their professional backgrounds influenced the health behaviours studied in this study.

Authors RF and SB are both Rohingya community leaders. We presented our initial analysis to RF and SB who clarified and helped with the interpretation of the findings to ensure participants perspectives were accurately reflected. Additional strategies to address potential power imbalances included the involvement of a Bilingual community leader when preferred by participants, and feedback from the broader research committee throughout, which includes individuals with diverse professional, cultural and religious backgrounds.

Results

Participant characteristics

In total, 16 participants were recruited. One-on-one interviews were conducted via video call with seven participants and one focus group with nine women took place in Lakemba, Sydney. Thirteen out of sixteen (81%) participants were women and included five community leaders, including one community Elder. The participants had been residing in Australia between four months and ten years.

Theme structure

Ten themes related to physical activity and twelve themes to food security were identified, all which fit within the constructs of the socio-ecological model. Figure 1 displays barriers (B) and facilitators (F) to physical activity participation and food security, as mapped to the socio-ecological model. Common themes across the two health behaviours can be seen in Fig. 1. Exemplar quotes for each theme are shown in the Supplementary Materials.

Physical activity barriers

Macro-level: visa status The impact of visa status was a focal barrier to physical activity participation. One participant described visa status as the root cause of most problems faced by the community. The stress and worry about insecure visa status were noted to reduce capacity to plan and attend physical activities. One participant shared how obtaining a permanent visa offers many opportunities and creates a sense of safety and dignity, which creates greater participation in physical activity and community as a whole.

> *"All sorts of problems is depending on their visa. If they have permanent residency they can find better job. Maybe afford better education and also support much better than this time they can support to their family, they can visit, they can meet. So many things they can do." (P5)*

Community level: limited transport options A barrier to physical activity discussed by many participants was a lack of transport. A few participants noted the challenge that "*some of [the community members] can't drive,*" particularly *"a lot of female not driving as well"*. It was suggested that organised physical activity can attract more involvement if hosted in a local area. An option that is made more feasible when it was discussed that many Rohingya people live in similar areas. When activities in the past had been held in areas further away, community members had increased planning around transport options or did not attend.

> *"Everything should be done in the community area like they don't want to go far like if they live in Lakemba, they want to do everything in Lakemba if we do the activity in the Blacktown, no one, no one will come yeah." (P2)*

Interpersonal level: lack of childcare Participants expressed that house duties and childcare responsibilities typically fall on women. A common barrier expressed was that childcare responsibilities prevented mothers from engaging in physical activity due to resourcing childcare and time or scheduling restraints. This expectation means mothers are limited by their child's schedule and for women to engage in physical activity, childcare would be essential for participation.

> *"The many kids the husband, 'who look after my kids?' Many of the husbands no look after kids. The one first big issue is the children. Any woman's physical activity comes with the children, child minding. Who look after? No child minding some of them can't come." (P4)*

Interpersonal level: cultural expectations Participants spoke about the impact of cultural expectations on women's roles and responsibilities.

Many women discussed how the views of men in the community, particularly those of their husbands, played a large role in limiting their physical activity engagement.

> *"So there are two types of men. The one type of men, they understand their wife's situation. They understand the women's situation, so they are happy to let them go as long as they bring the kids with them. There another type of men who want to stop those woman going anywhere. Even they stop them come into the [exercise group],they stop them go to the English class." (P2)*

> *"One thing is the big barrier is the husband decision. They ask permission [of the] husband. Then some of the husbands say, 'oh don't go.'" (P4)*

Some women explained that their view of what physical activity involves had changed since being in Australia. For example, many previously associated physical activity with home duties, however after living in Australia, now view planned, leisure time exercise as an example of physical activity.

> *"When I was young, I thought physical activity means doing housework like cleaning, washing and things like that, but I realised in Australia, it is not physical activity. Physical activity is [when] you have your own time for yourself." (P2)*

Interpersonal level: lack of culturally appropriate options It was discussed that women experience more cultural barriers than men to participate in physical activity and there being a lack of culturally appropriate options. Both men and women shared that for Rohingya women to engage in physical activity there needs to be women's only spaces, a qualified female instructor, and a private enclosed setting. Other considerations included language barriers when seeking to join fitness facilities or programs and potentially feeling shame for engaging in an activity for the purpose of managing their own health.

> *"For men, they have more resources. Like they can go to gym quickly. For female they think oh it's inappropriate for me to go to gym by myself with friends. Unless it's a female only setting. Which is not many happening here." (P1)*

Intrapersonal level: lack of resources and knowledge about existing programs At the intrapersonal level, a common barrier reported by participants was a lack of awareness or knowledge about how to access physical activity programs in their new communities. Participants generally were interested in trying new sports or physical activities but without knowing where to find or how to access opportunities, they have been unable to be involved.

Similarly, while participants were interested in a range of activities, the associated cost was a limiting factor to finding options that are enjoyable and suitable. Financial restraints were reported as a barrier to participation by one participant below,

> *"My mum was saying there is a tension because for us we can only walk around and for the cost she's worried about that." Interviewer: "The cost of what in particular?" Participant: "To join a swimming lesson." (P7)*

Physical activity facilitators

Community level: increased opportunities to engage Many participants spoke of having more opportunities to engage in physical activity in Australia compared to Myanmar. Many reported being exposed to a variety of different sports in Australia, encouraging involvement and a change in the types of sports enjoyed by the community.

> *"In Myanmar, we don't really know about like baseball, cricket you know. Like, we only know badminton we play that. Other than that we don't really know. After we came here we learn more about it. Like we know all the sport now." (P6)*

One participant discussed the intergeneration effect and potential for adults to be role models. They noted that the attitudes and beliefs about physical activity held by adults in the community directly affect children's participation rates.

> *"Those people and the parents that hasn't really been exposed to that culture yet, are less likely to let their kids, especially the daughters to participate in the physical activities compared to the parents who are who are educated and got exposure prior to arriving in Australia. (P3)*

Another participant noted that in Australia, perceived safety outside the home is an improvement to conditions in Myanmar, allowing for increased ability to participate in activities.

> *"It's completely different in Myanmar. I was always in the house because we are very scared to go outside even I live in Myanmar for nearly 20 years, I never know how to use the train, I never know how to use how to use the bus. When I go to school my father drove me. Just stay at home, all the time for 20 years. No activities." (P2)*

During the focus group discussions, the women expressed varying perspectives on changes to their incidental physical activity. Some participants reported an increase in their incidental activity, while others noted the opposite effect. This was due to lifestyle change, including access to basic needs affecting chores and daily tasks.

> *"In our country we don't do physical activity at all, but in here we have to. For example we going for the shopping, we picking up, drop the kids, we go to the doctor so we must walk. Compared to the country, here we do more activity." (FG)*

> *"And then we have to carry the water from here to there, but in Australia we just open the tap." (FG)*

Interpersonal level: social support The opportunity to socialise was discussed as a motivating factor for physical activity participation. Many participants preferred group-based activity for this reason, and enjoyed the opportunity to be with their community.

> *"For the main reason is to have fun and active and get and have some more friends. Get some friends, because as like me every woman wants to have fun and they also want to have one hour for themselves, maybe in a week or maybe in twice a week, so if they do the dance group or yoga group, that time they're mind is fresh and they're happy, they're just laughing." (P2)*

Intrapersonal level: health literacy Many community members reported having a good understanding of the benefits of physical activity for health.

> *"They're not happy to do exercise but they should do exercise to handle with their health you know to cover their health but because of the stress because many things problem any problem they face in the past, so they're still remember you know." (P5)*

Intrapersonal level: experienced health benefits The mental, physical and social benefits were frequently discussed as facilitators to physical activity participation.

Most participants discussed the mental health benefits of physical activity as a key facilitator of their participation in chosen activities.

> *"I play soccer I play football.....I like to go to the gym.That's my physical activity and if I do that, that gives me a break from my mental and emotional exhaustion." (P3)*

Community leaders understood the benefits of regular physical activity. They emphasised the importance of promoting physical activity in their communities, given the high levels of stress experienced by many community members, often linked to some barriers to physical activity participation, such as the stress related to visa status.

> *"Think forgetting the worry for a while, for a moment, is important for the Community. Women they always worry I'm thinking too much. Not much of the woman worry about the weight or their diet, or their health. The most of them worry about their life situation, their future, things like that." (P2)*

While the physical health benefits of regular participation such as improved fitness and sleep quality were mentioned by a few participants, it was not identified as a key motivator for participation. The social benefits were more frequently discussed, with community leaders suggesting that some members of the community are motivated by the friendships and social connections created through sport and physical activity.

> *"I think it's also a lot of people feel loneliness you know. They hardly see any families, so the games and the physical activity give them a chance to see other people so feel good. It is all on the mental health." (P1)*

Food security barriers

Macro level: visa status and restrictions on income Similarly to physical activity, visa status was also a relevant barrier to food security. Permanent visa status was emphasised as giving the Rohingya community in Australia more work and income opportunities. This is because a higher income was seen to allow education and support for a family to facilitate healthy eating, ultimately improving the 'access' pillar of food security. People without permanent visas reported income restrictions and often no access to government support- a problem exacerbated by the COVID- 9 pandemic.

> *"We have some asylum seekers who don't have access to government support. We're really concerned. We've been advocating for this, especially during COVID, you can't find jobs and they don't have any support. They used to have SRS [Status Resolution Support] payment so since the payment is gone everyone relying on NGOs." (P1)*

Macro level: cost of buying healthy food Some participants highlighted the significant impact of food costs on food security. Participants emphasised the challenges they face in affording fresh fruits and vegetables, as well as a sufficient quantity of food, due to the increased cost of living.

> *"I know that my children eat not enough vegetables but I have to cook what I have. Rice and then curry can do it. Not enough. We can't cover the [cost], I feel not enough." (P4)*

The issue of food affordability was primarily a concern raised by women participants. They suggested that men may not be fully aware of the challenges associated with the cost of buying food, as women are typically responsible for grocery shopping and cooking.

> *"For the older people like my dad, they know before for twenty- to thirty-year-old for the men they won't know [the price of food], because they just get what they want. For the woman like us, we look at the price, and then buy it." (P6)*

Macro level: lack of culturally responsive health and social services In situations where social services provide dietary and nutritional counselling/recommendation/advice/guidance, there is sometimes a lack of cultural sensitivity which undermines their ability to cater to diverse cultural needs. As a result, one participant reported not receiving appropriate and accessible supports, and thus impacting the 'utilisation' pillar of food security.

> *"I know so many of my friend became angry, after listening the dietitian what she said. They told me, how can we stop eating the rice and she just making me hungry for all the day, how can I change my diet?" (P2)*

> *"People hungry but everyone is following culture food. I saw the many organisations supporting food boxes, but is not its culture food. Our culture not using the canned stuff. They using the fresh. They have can everything, but they don't use it."(P4)*

Macro level: availability of culturally appropriate traditional foods While participants acknowledged the presence of Rohingya grocery stores in Australia, some

reported encountering difficulties in finding specific traditional foods, such as certain types of fish, vegetables, and grains. This has an impact on the 'availability' pillar of food security. It was also noted that although stores are generally accessible, they are primarily concentrated in major cities, posing challenges for individuals residing outside these areas. Additionally, some concerns were raised regarding the conditions that livestock are raised, and the preparation methods of the available food items; impacting the 'utilisation' pillar of food security.

> *"A lot of people even think the meat, for example, if the meat buy from the shops, they think this cow how they were raised and in the farm, not in the very healthy environments, they don't feed us. They look at the factor that how this meat came from you know these are the really farm free, cage free." (P1)*

> *"There are so many, there is some type of grain which are not available in Australia. Like fruits you can, plants, but some of the grains." (FG)*

Intrapersonal level: lack of knowledge of where to purchase traditional food As people resided in Australia longer, knowledge of where to purchase traditional foods was less of an issue as they had formed community networks. However, for new arrivals, this remained a barrier to health eating, and impacted the 'access' pillar of food security.

> *"2013 arrival they in Australia. Those times it's hard for people to find our food, fresh food because no access there for the community, we don't know the leader, we don't know the community and then now it's the new arrival Rohingya come to Australia because of the connection network for community and then before it's the one community 2013 but now is the 3 community in Lakemba and then we very comfortable, we buy the food in Lakemba or Bankstown is the Muslim community and then we very comfortable which are Halal and not Halal." (FG)*

Intrapersonal level: lack of time to prepare and cook healthy foods Participants spoke of various reasons for not having the time to prepare and cook healthy food such as feeling tired, impacting the 'utilisation' pillar of food security.

> *"We lazy, we tired, we don't have energy, enough energy, we thinking that would depress too much at home because we not give it to our body right things, you know I mean?" (P4)*

Young single men were identified by participants as a specific group facing this barrier due to demanding working commitments and limited time available to prepare and cook healthy meals.

> *"With the single males they're mostly working so hardly have any time to prep their meals so they kind of stick to ready-made foods.." (P1)*

Food security facilitators

Community level: availability of traditional foods While availability of traditional foods was acknowledged as a barrier for some participants, many participants expressed little difficulty accessing traditional foods. Most participants reported that it is becoming increasingly easier over time to access traditional foods in Australia.

> *"It's very good variety and I even surprised, sometimes you get more stuff than back home." (P1)*

Community level: increased sense of safety enabling women to do the groceries Women expressed feeling an increased sense of safety in Australia, compared to Myanmar, enabling them to go shopping for groceries. This theme related to the 'access' pillar of food security.

> *"Women can go do their shopping in Australia, but not in Burma because we cannot go out even to the next suburb. We can't go out because the government is very bad especially to the women. They feel so scared… but in Australia we have freedom so it's very good." (FG)*

Community Level: access to fresh fruit and vegetables Fresh fruit and vegetables were valued by the community in comparison to processed foods. There were discussions of changes to accessing fresh fruit and vegetables and the varieties available. Overall, there was satisfaction with the quality of healthy food, however cost and preservation methods such as refrigeration were discussed in comparison to living in Myanmar where fruit and vegetables would be grown at home and eaten quickly after harvesting. However, women who wanted to avoid freeze preserving food changed shopping habits to every two or three days to ensure fresh food was eaten.

> *"In our country we get it every day fresh fruit and vegetables but in Australia we have to keep it in the fridge for like a week." (FG)*

Community level: social service support for food insecurity Participants acknowledged the important role played by Non-Governmental Organisations (NGOs) in addressing food insecurity through initiatives including the provision of food boxes and free groceries. A range of NGO supports were discussed maintaining food security while a majority of finances are spent on rent and health, leaving little for groceries.

> *"I would just say that there is some organisation in Lakemba. I bring there every Sunday, or Tuesday they give out food. It's in Lakemba library. Grocery. I would say it would be hard if we don't have that organisation." (P6)*

Interpersonal level: social support for recently arrived community members The presence and value of social support and community leadership within the Rohingya community, was discussed as a facilitator in promoting food security. Participants shared their experiences of supporting each other and highlighted the power of grassroots initiatives. Community leaders expressed community members sometimes approach them when in need, motivated to support their families. While other times the leaders identify community members who may need assistance with food security.

> *"There's a possibility of the sense of shame. However, I don't think anyone will be shame to see their kids go hungry or starve and if they see that their kid is going through hunger, they will definitely come to us." (P3)*

Intrapersonal level: health literacy Participants reported having a good understanding of the importance of consuming certain types of foods for health, aligning with the utilisation pillar of food security. They demonstrated a motivation for healthy lifestyle behaviours to manage and prevent chronic diseases such as high blood pressure and diabetes. They also believed that traditional foods were healthy and paid attention to the preparation of foods to determine health benefits.

> *"We understand fruit and vegetables main part of the health environment."(P1)*

Discussion

Our study presents barriers and facilitators to physical activity and food security among members of the Rohingya community who have resettled in Sydney, Australia. To provide a comprehensive understanding of these factors and the multifactorial efforts needed to improve health outcomes, we applied the Socio-Ecological Model Framework and considered the four pillars of food security. We identified that influencing factors for physical activity were organised into ten themes, with the greatest influences classified into the interpersonal level such as cultural expectations and gendered norms, and social support. Twelve key themes were identified as influencing food security, with the greatest impact seen at the macro and community levels.

Our study found overlap in the barriers and facilitators affecting physical activity and food security. Many factors, such as visa status, lack of knowledge about available supports, health literacy and social support intersected across the two health behaviours. Across both behaviours, many barriers were experienced at the macro level (which considers institutional patterns within society including economic, social, educational, legal and political systems) including visa status, lack of culturally responsive services, availability of culturally appropriate foods and the high cost of buying healthy foods. The effects of these barriers defined by the macrosystem have a cascading influence throughout the interactions of all other layers. Most facilitators were discussed at the community level including access to fresh fruit and vegetables, NGO support, and increased sense of safety to purchase groceries in Australia. Therefore, the complex interplay of these factors highlights the need to consider the multifaceted nature of influences on behaviours regarding physical activity and healthy eating within different contexts.

Physical activity

Overall, many participants reported that their views and opportunities to take part in physical activity had changed since migrating to Australia. For example, some participants noted that that they previously viewed physical activity solely as household related activity, and since being in Australia, they had gained a new understanding of leisure time of activity. A previous study explored this idea of leisure time activity among a group of migrant refugees living in Australia and found cultural differences in the value and perceived benefit of experiencing leisure including the view that leisure time activity 'makes you lazy', and that it lacks consideration of disadvantage and barriers to settlement [9].

At the intrapersonal level, a lack of resources and knowledge about existing programs was identified as a barrier to physical activity. Despite expressing interest in taking part in programs, such as swimming lessons, participants reported a lack of awareness about how to access such programs. This may stem from a lack of suitable, in-language information dissemination or targeted outreach efforts by relevant organisations or community services. This finding highlights the

significance of effectively targeting and communicating health information to refugees and migrants, considering multi-modal delivery and in various languages to improve accessibility [46].

Many barriers were identified at the interpersonal level, including childcaring responsibilities, cultural expectations and a lack of culturally appropriate physical activity options. Notably, all these barriers predominantly affect women, as they expressed feeling pressure to adhere to traditional gender roles and prioritise household duties over physical activity. This is in line with existing research which has shown an association between culture and cultural norms and physical activity participation among various migrant communities, suggesting that female participation is often viewed as culturally inappropriate, or as neglecting family responsibilities [47, 48]. Physical activity services and programs therefore need to offer women only, culturally responsive resources and facilities to support participation [49–51]. They should also support children attending or consider affordable childcare options to provide opportunity for women to participate.

At the community level, limited transport options were highlighted as a significant logistical barrier to physical activity. Participants emphasized the challenges associated with accessing suitable facilities and recreational areas, particularly for those living in areas with inadequate public transportation or those who cannot drive [52]. Finally, at the macro level, visa status emerged as a significant barrier, and one that strongly affected both physical activity participation and food security. The temporary nature of non-permanent visas limits access to stable employment and income. This is a stressor which has shown to contribute to poor mental health outcomes [5, 53, 54] and negative brain changes [55]. These consequences then impact the opportunity and motivation to participate in health-related activities.

On the other hand, numerous facilitators were discussed as motivators to physical activity across the levels of the socioecological model. At the interpersonal level, participants highlighted the significance of supportive relationships with family, friends, and community members in encouraging and sustaining their physical activity behaviours. Social support provided motivation, encouragement, and accountability. A previous study which explored influences on health for refugees from Myanmar in Australia also social connections and feeling part of a community is a key part of health [56]. Health promotion efforts should capitalise on this facilitator and prioritise fostering supportive community environments, where participants can support each other to engage in health-promoting behaviours.

Increased opportunities to take part in physical activity in Australia, compared to Myanmar, was also frequently discussed. However, while some participants reported having access to a greater range of types of sports and facilities available as a facilitator, many women did not discuss these same opportunities. Facilitators at the intrapersonal level including physical health literacy and experienced health benefits. An understanding of the health benefits, and previous positive experiences with physical activity such as enjoyment, improved mental health, socialising, were important facilitators. A focus on health literacy should therefore be a target for intervention [51].

Food security

There were no facilitators to physical activity, nor food security at the macro-level. Rather, like physical activity, visa-related stress emerged as a significant barrier to food security. Closely linked with the consequences of visa status and the implications on employment opportunities, the cost of healthy food was identified as one of the most significant barriers. Participants shared their struggles of purchasing vegetables due to the cost, often resulting in choices of sacrificing their own meals or sharing limited food resources with their families. This is aligned with the food security domain, 'access,' which has previously been identified as problem for some resettled refugees in Australia [22].Previous work has shown that financial, medical and household bills are prioritised, causing a lack of funds for food and adequate volumes of food [22]. Policies and programs that address visa insecurity and provide pathways to permanent residency or employment stability may contribute to improving the health outcomes of the Rohingya community. Obtaining permanent residency was seen as a crucial opportunity to enhance participation in physical activity, providing a sense of safety, dignity, and increased opportunities for employment, education, family support and food security.

While social services have attempted to support those who are food insecure, efforts are often not culturally responsive, affecting the 'utilisation' pillar of food security [22]. For example, participants reported that food boxes provided by these services are often made of up of non-traditional and canned foods, which does not align with their cultural practices. Organisations need to work with community members to co-design culturally responsive food assistance programs [57, 58]. It is also important for staff including health professionals to have cultural sensitivity training to support improved health outcomes for those that are food insecure [59–61]. No barriers at the interpersonal level were identified, while at the intrapersonal level, lack of knowledge of where to purchase traditional foods and a lack of time were reported as barriers.

The availability of culturally appropriate traditional foods was highlighted as both a barrier and facilitator to the availability pillar of food security. Some participants reported easy access of traditional foods at local supermarkets, while others reported not being able to buy specific grains, spices etc. However, it should be acknowledged that most participants reported that the situation had improved since being in Australia, potentially due to increased settlement and in turn, community demand. This may be similar to the physical activity barrier where the knowledge about how to access services is limited. At the community and interpersonal levels, there were no barriers to food security, while at the intrapersonal level, a lack of knowledge of where to purchase traditional foods and lack of time to prepare meals was discussed. This should be addressed by ensuring clear and accessible health communication [62, 63].

Facilitators to food security related to the 'access' pillar of food security and included NGO support, an increased sense of safety for women to buy food, and access to sufficient quantities and quality of fruit and vegetables. At the interpersonal level, social support was identified as a facilitator, with participants expressing that they would rely on others and offer support to others for food if needed. This highlights the significance of having a supportive network to support those who are food insecure [64]. It also emphasizes the role of community leaders and members in providing vital support during times of need. It is important however, to acknowledge that while NGO and social support can support the 'access' pillar of food security, they may not provide 'stability', as a sudden change to these supports could mean food insecurity returns. Therefore, while these additional supports are valued and useful, they are temporary solutions to a larger problem identified – that is the impact of the macro level of food security, and the call for government to consider the implications of visa status on health outcomes of people trying to secure themself safety in Australia. Finally, participants had good overall knowledge about nutrition and its impact on health, and therefore nutritional literacy was identified as a facilitator at the intrapersonal level.

Strengths and limitations

This study had several limitations. Firstly, the transferability of the findings to other contexts, for example, the Rohingya community living in metropolitan Sydney, compared to those living in rural and remote areas is unknown. Secondly, due to practical constraints, we had multiple interviewers conducting the interviews. While efforts were made to ensure consistency in the interview process, the involvement of different interviewers may have introduced variability in the data collection. In addition, since the study explored both physical activity and food security, the depth of each topic was not as detailed as it may have been if they were examined separately. Although separate questions were created, the semi-structured interview design allowed participants to guide the discussion, and often participants discussed nutrition during the physical activity questions and visa versa due to the overlapping nature of these health behaviours.

A significant strength of our study is the collaborative community-engaged approach we adopted. This included the active participation of a community organisation, and of community leaders throughout the research process. They played a crucial role in co-designing the interview questions, ensuring that the topics addressed were relevant and resonated with the community. Additionally, community leaders were actively engaged in the interpretation of the findings, providing contextual understanding and helping to ensure the accuracy and authenticity of the data analysis. In addition, the study employed a comprehensive approach to sampling, ensuring representation from a wide range of community members, including leaders, elders, and the general community. Lastly, the research was underpinned by a widely used and contemporary theoretic framework which allowed us to rigorously test and explore constructs.

Conclusion

Addressing barriers to physical activity and food security requires a multi-faceted approach that considers the impact of insecure visa status, cultural expectations, childcare responsibilities and the availability of culturally responsive services and programs. Understanding these factors from a socio-ecological perspective provides a comprehensive framework for developing interventions and policies that address the complex and interconnected challenges faced by this community. Collaborative efforts involving community leaders, policymakers, health professionals, and social service providers are essential for implementing targeted interventions and policies that promote physical activity and food security within the Rohingya community in Australia.

Supplementary Information

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Supplementary Material 1.

Supplementary Material 2.

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Not applicable.

Authors' contributions
SR, DW, EL conceived the study idea. SN, RF, SB supported recruitment. GM, CM, DW, EL, SR collected the data. GM and CM conducted the analysis with support from ST and SR. RF and SB helped with the interpretation of the findings. GM led the write up and all authors contributed.

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Data availability
The datasets generated and analysed during the current study are not publicly available to protect participants confidentiality but are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Ethics approval was gained from South West Sydney Local Health District (2021/ETH01115) and University of New South Wales (2021/ETH01115 External Human Research Ethics Approval) prior to recruitment. All participants provided informed consent prior to participating.

Consent for publication
All participants provided consent.

Competing interests
The authors declare no competing interests.

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