Journal of Public Health | Vol. 47, No. 2, pp. 160–168 | https://doi.org/10.1093/pubmed/fdaf025 | Advance Access Publication March 7, 2025

Conceptualizing the effects of COVID-19 on eating and physical activity in people with type 2 diabetes and hypertension in Ecuador using the social ecological model

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ABSTRACT

Background: Our aim was to explore patients' perceptions of changes in diet and physical activity in people with type 2 diabetes mellitus and/or arterial hypertension in two low-income districts of Ecuador.

Methods: We carried out a qualitative study of 19 telephone interviews in August–September 2020 with people with type 2 diabetes mellitus and/or arterial hypertension. Interviews were recorded, anonymized and transcribed verbatim for analysis using the social ecological model.

Results: Within the context of poor access to the health services, participants identified a lack of social policies to address food insecurity and income stability. Food insecurity was related to mobility restrictions and loss of income, particularly among vulnerable populations, such as migrants and women. Changing work environments influenced physical activity patterns and food availability. Family support was crucial to overcome economic shortfalls allowing for better eating habits. Despite recognizing overeating as detrimental to disease management, participants reported increased desire to binge eat due to emotional distress and anxiety.

Conclusions: The lack of social policies dealing with poverty and food insecurity during the pandemic made non-communicable disease self-care with physical activity and diet challenging for vulnerable populations.

Keywords: COVID-19; diabetes mellitus; Ecuador; health inequities; hypertension; low- and middle-income countries; non-communicable diseases

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Introduction

Authors have referred to the syndemic nature of the COVID-19 pandemic,[1] where viral infection and non-communicable diseases (NCDs) rooted in social inequalities interact. This issue is highly relevant in the Latin American region where NCDs have become the leading cause of mortality in the last decade,[2] causing 81% of all deaths.[3] Data obtained from the STEPS Survey in Ecuador conducted in 2018 showed that ∼20% of the population had arterial hypertension (HTA) (23.8% in men and 16.0% in women), and 7.1% (7.6% in men and 6.7% in women) had type 2 diabetes mellitus (T2DM). Among the population aged 45–69 years, more than 1 in 3 individuals had HTA and 1 in 8 had T2DM.[4] The inequalities in the burden of these diseases are largely attributable to social determinants such as poverty, education, gender, urbanization and ethnicity and/or race. These factors condition the population's options for access to a healthy diet and physical activity, both of which are of major importance in the management of HTA and T2DM.[5–8]

Pandemic control measures, particularly in the first months, had a major impact on the population. Social isolation, in combination with physical distancing, produced changes in the daily routines of citizens (e.g. physical activity levels, eating habits).[9,10] However, the effects were uneven across countries and settings, with some studies showing positive changes such as an increase in vegetable and fruit consumption, while others showed negative changes such as an increase in the consumption of sugary products and snacks, together with a significant reduction in physical exercise. However, most studies to date have been conducted in Western and high-income countries such as the USA, the Netherlands and Spain, among others.[11,12]

The lack of economic resources and job opportunities plunged the economy into one of the worst recessions the country has ever faced. In addition, the public health emergency challenged the ability of the healthcare systems to meet the essential needs of the population.[13] Here, our aim is to explore changes in diet and physical activity in patients diagnosed with T2DM and/or HTA, and to provide information on patients' perceptions of why these changes occurred broadening the view from the individual to the context.

Methods

Study design and context

A qualitative, exploratory study using semi-structured telephone interviews was conducted during August and September 2020 in two settings in Ecuador: the low-income districts of south Quito and a rural area of the province of Esmeraldas (which accounts for ∼70% of the Afro-Ecuadorian population in the country and is characterized by extreme poverty and limited infrastructure).

Study population and data collection

Recruitment strategy was purposive sampling to include a group of people with T2DM and/or HTA that was heterogeneous in terms of gender, age and socioeconomic status. In Quito, we recruited participants with the help of the diabetes patients' clubs at different public primary care facilities, and in Esmeraldas, we recruited them with the help of community health promoters through the Centre for Community Epidemiology and Tropical Medicine (CECOMET). We increased the number of participants until we reached saturation, and no new information was obtained.

The interviews were conducted by telephone because they took place during the mobility restrictions implemented during the COVID-19 pandemic.[14] The duration of the interviews ranged from 16 to 53 min. Details on data collection can be found in previous publications.

Data analysis

The interviews were recorded and transcribed verbatim for analysis. They were then uploaded to Atlas.ti 8 for content analysis to organize the key findings into key themes. For the publication of this article, the verbatims have been translated into English (the Spanish version and its translation can be found in the supplementary material).

The research group of seven researchers (one man and six women) agreed to use a basic set of codes, organized according to the objectives of the project, for the analysis. Each interview was coded by two researchers (I.B.D., E.C.R.) from different disciplines, both of whom had experience in qualitative data analysis. Then, a comparison of the codes was made between each pair and possible discrepancies were discussed.

We identified categories by cross-referencing the coded information and classifying it according to the social ecological model which is a framework for analysing the multiple levels of a social system and the interactions between individuals and the environment surrounding the individual or group of individuals (Supplementary file, Fig. 1).[15]

Results

Table 1 shows the sociodemographic data of the 19 participants (9 women). Interviewees reported changes in healthy habits related with diabetes and hypertension control because of the COVID-19 pandemic, which are described below

Table 1 Sociodemographic characteristics of the participants

Sex	*Age*	*Disease*	*Disease duration in years*	*Marital status*	*Education*	*Occupation*	*Monthly income (USD)*	*Location*
Female	43	DM2	6	Married	Superior	Teacher	750–800	Esmeraldas
Female	51	DM2	18	Married	Superior	Teacher	420	Esmeraldas
Male	50	DM2	12	Married	Primary	Construction worker	250	Quito
Male	61	DM2-HTA	5	Married	Secondary	Farmer	300	Esmeraldas
Female	48	DM2	2	Single	Secondary	Book consultancy	No income	Quito
Male	70	DM2	10	Married	Secondary	Commercial	800	Quito
Male	56	HTA	20	Non-marital union	Secondary	Nursing assistant	580	Esmeraldas
Female	53	DM2-HTA	—	Single	Secondary	Cleaner	250	Quito
Male	63	DM2-HTA	20	Non-marital union	Superior	Unemployed	No income	Quito
Female	73	HTA	15	Non-marital union	Primary	Housewife	100	Esmeraldas
Male	59	DM2	17	Married	Primary	Construction worker	No income	Quito
Female	55	DM2	15	Married	Secondary	Street vendor	No income	Quito
Female	50	DM2	15	Married	Superior	Street vendor	No income	Quito
Male	53	DM2	21	Married	Secondary	Taxi driver	No income	Quito
Female	52	DM2	4	Married	Primary	Unemployed	No income	Quito
Male	65	DM2	21	Married	Secondary	Printing service	300	Quito
Male	58	DM2	18	Non-marital union	Secondary	Laboratory technician	622	Esmeraldas
Female	63	DM2	—	Married	Primary	Housewife	No income (using savings)	Quito
Male	67	DM2	—	Divorced	Primary	Farmer	140	Quito

organized by the different levels of determinants of health according to the socio-ecological model.

Public policy

At the macro and public policy level, there was a generalized discourse that expressed a lack of public policies to address the worsening food situation. Participants reported lack of access to food due to mobility restrictions throughout the country, with a particular hardening in the capital, together with the loss of employment and income due to the pandemic. In this regard, people expressed the need for social policies including food voucher programmes, which are an important resource for low-income populations and can help reduce food insecurity. This lack of resources was more pronounced among migrants and people at higher risk of social exclusion in the country (Table 2, Quote a).

Due to the lockdown and curfew imposed by the Ecuadorian Government (which at times lasted from 2 pm to 5 am), people were barely able to leave their homes. For some interviewees, this meant a significant reduction in routine physical activity (Table 2, Quote b). In the rural setting, this limitation of movement was eased by the fact that interviewees' properties had land, which allowed for walking and other activities (Table 2, Quote c).

Community factors

At the community level, limited movement and work environment changes had an impact on the uptake of physical activity. Particularly, for work activities that had to be suspended, such as street vending (Table 3, Quote a). Also linked to the precariousness of working conditions, some people associated their hours of activity to the working hours at their workplaces (Table 3, Quote b).

In addition, the work environment of some people before the pandemic was negatively related to their diet because of the presence of street food outlets selling ready-made meals

Table 2 Quotes from interviews with patients in Quito and Esmeraldas diagnosed with T2DM/hypertension on the impact of COVID-19 measures on their diet and physical activity that refer to the public policy level of the socio-ecological model

Key	*Direct quotation*	*Profile*
a	'Have you received any kind of support, I don't know . . . economic, social? No [I haven't received any kind of economic support] as I said I asked the IAS, because the first time they helped me, they gave it to me. Sorry, what is the IAS? I don't know. It's an Inter-American thing, that comes from abroad, I don't know, help from abroad, when they gave it to me they gave it to me for six months, I only took it for four months because I had to go to Venezuela, and they gave me a 50 dollar voucher for a supermarket so they would give me food, and well, I have just asked for it again and I got it for a month and then they cut me off because they told me that they could not give it to me anymore because they had already given it to me before, I got tired of writing and I told them that I was a 55 year old person who suffered from diabetes and so on and that I didn't have enough to eat, that could they please help me, that I was a person who never asked anyone for anything, but the situation forced me to, and they answered that they didn't know, I don't know why, I don't know anyone here, besides I have problems with my passport here and I have not been able to do it because I need money to be able to do it. (Woman crying)'	Immigrant woman, 44 years old, street vendor, Quito
b	'Well, it has affected me . . . I can't go out because of the pandemic, nobody can go out . . . Here where I live, I can only walk a bit, go up and down stairs, but it's not like going out freely'	Male, 53 years old, taxi driver, Quito
c	'. . . In the confinement we were not working, so I dedicated my time to walking, to do any work going in the countryside, so, I did not stay locked up at home, this is the countryside, I go for walks, not in the street but on the farm that is nearby. So, in that sense it hardly affected my physical health, but it did affect my emotional health, as I said before, it affected me a lot'	Woman, 43 years old, teacher, Esmeraldas

and fast food rich in fat and sugar. In some cases, interviewees reported positive changes in their diet due to changes in working conditions, such as less time outside their home, which allowed them to pay more attention to diet and made them less reliant on food that was not home cooked (Table 3, Quote c).

Mobility and transport constraints had a major impact on food availability. The cost of transport was an added factor that made mobility difficult, and shops also lacked supplies to sell to people, particularly in Esmeraldas as it is an area that is difficult to access. Thus, in some rural areas dietary variety was limited as people were unable to travel to obtain certain foods and were limited to consuming what they could produce in their gardens (Table 3, Quote d). In the rural setting, the limitation of movement during the full lockdown also prevented activities such as fishing, which is an important source of food for these populations (Table 3, Quote e).

However, people living in Esmeraldas described a lower impact on physical activity in terms of outdoor mobility restrictions related to the neighbourhoods and type of housing they had with land to farm or walk. This situation would be comparable to that of people living in *condominios* in Quito. *Condominios* are large residential structures divided into apartments that share common spaces (corridors, gardens, sports areas . . .) (Table 3, Quote f). On the other hand, people with less space in their homes reported that they had to stop physical activity, which they perceived as having a negative impact on their disease control (Table 3, Quote g).

Intrapersonal factors

Social support from family members was crucial to overcome the economic shortfalls and the unavailability of food, which allowed for better control of diet and eating habits. Social support from the family in the purchase of food and financial support provided by them due to loss of employment and income during the pandemic, as explained above, fostered greater social cohesion between children and parents and families in general. (Table 4, Quote a). Support was also seen among neighbours by sharing knowledge and information related to food. However, relatives of chronically ill people feared catching an infection on the street, therefore limiting their outdoor physical activity. Instead, they adapted exercises to the home environment (Table 4, Quotes b and c).

Interpersonal factors

Mobility restrictions also had a negative impact on people's diets, particularly for those engaged in informal work (such as

Table 3 Quotes from interviews with patients in Quito and Esmeraldas diagnosed with T2DM/hypertension on the impact of COVID-19 measures on their diet and physical activity that refer to the community level of the socio-ecological model

Key	*Direct quotation*	*Profile*
a	'The thing is that I spend 3 to 4 hours every day walking on the street selling my products, so as I was locked up . . . I didn't walk, I practically did no exercise, so that affected me a lot during the first two months'	Male, 70 years old, salesman, Quito
b	'Yes, I clean the workshop here, I clean it all day long, when people are working I go out and clean the offices, I clean everything and I am active . . . I used to walk but now I can't go out'	Female immigrant, 44 years old, street vendor, Quito
c	'Well, before I used to eat a bit more, but now that I'm confined I eat more healthily than before, so things have changed, because I don't eat what I used to . . . I used to eat in the street, I used to eat whatever, but now that I'm at home everything is healthier. Aaa, before, what I used to eat was junk food . . . And now what I eat is the food I make here, one day I make vegetables, another day I make soup, and so on, so I eat more healthily, I don't eat junk food like I used to eat before, so things have changed'	Male, 55 years old, taxi driver, Quito
d	'What are you doing, how are you feeding yourself? There eating any vegetable I have'	Female, 52 years old, housewife, Esmeraldas
e	'. . . Locked down because we couldn't go out, we couldn't walk in the street and all sorts of things . . . we had to stay home a bit, we didn't go out to work, or to the country or to our farm, but anyway, it was a bit difficult to feed ourselves and also to go fishing because they wouldn't give us permission to go out'	Male, 58 years old, laboratory assistant, Esmeraldas
f	'. . . In the confinement we were not working, so I dedicated my time to walking, to do any work going in the countryside, so, I did not stay locked up at home, this is the countryside, I go for walks, not in the street but on the farm that is nearby. So, in that sense it hardly affected my physical health, but it did affect my emotional health, as I said before, it affected me a lot'	Woman, 43 years old, teacher, Esmeraldas
g	'Of course, don't you see that you can't do anything, besides, I think that people who have a big house and have a gym lead a normal daily life, but in our case, we are in a small flat, I wanted to buy a treadmill but, it's too expensive, no no no. I was just thinking about it with my husband right now, I mean, what I was talking about yesterday, I mean I'm going to have to buy a treadmill so that I can do my exercise in here, because we don't have any other option'	Woman, 50 years old, street vendor, Quito

street vending) who lost their sources of income. The socioeconomic situation due to the discontinuance of economic activities led to a limited access to food, in some cases causing people without food for whole days (Table 4, Quote d).

In terms of health status and perception of care, some of the interviewees had difficulties accessing health services and medication to manage their disease and improved their eating habits as the only means available to them to maintain good control of their diabetes. This led to moderation of carbohydrate intake and sugar consumption, increased consumption of vegetables and fruit, and a decrease in unhealthy cooking techniques such as frying (Table 4, Quote e). People mentioned a greater commitment to reading nutrition labels due to increased time availability during the pandemic, which influenced decision-making when purchasing food (Table 4, Quote f).

Despite recognizing overeating as detrimental to disease management, people reported increased desire to binge eat due to emotional distress and anxiety resulting from lockdown measures, which were further exacerbated by media reports of the pandemic (Table 4, Quote g). One's emotional state and perceptions of fear were frequently reported as reasons not to go out, as they identified themselves as a high-risk group for COVID-19 and preferred not to expose themselves. This, in turn, led to a decrease in their physical activity (Table 4, Quote h).

Original quotations in Spanish and their translation in English can be found in S1.

Discussion

Main finding of this study

This study explored the perceptions of patients with hypertension and T2DM regarding the self-management of their conditions with exercise and diet during the first months of the COVID-19 pandemic. Most of the people interviewed reported negative changes in their diet and physical activity that were exacerbated by loss of employment and income

Table 4 Quotes from interviews with patients in Quito and Esmeraldas diagnosed with T2DM/hypertension on the impact of COVID-19 measures on their diet and physical activity that refer to the intrapersonal and interpersonal level of the socio-ecological model

Key	*Direct quotation*	*Profile*
Intrapersonal level		
a	'So food, they are always making sure (referring to his daughters), well, that I have enough fruit, vegetables, well, all that, no, no, there have been no problems with that'	Male, 53 years old, taxi driver, Quito
b	'But not now, my wife won't let me and my children won't let me, and sometimes I go out, but what I do here is go up and down stairs'	Male immigrant, 65 years old, printing services, Quito
c	'I don't do it, okay? I don't do it because at home I do dance therapy with my son, my daughter, my nephew, sometimes we do dance therapy'	Woman, 51 years old, teacher, Esmeraldas
Interpersonal level		
a	'. . . but sometimes I feel a bit dizzy because we haven't been able to have breakfast, we haven't been able to have lunch, and sometimes I have to go to bed because I have no other choice'	Immigrant woman, 44 years old, street vendor, Quito
b	'So the difference is that we take care of our basic diet, what we shouldn't eat, we leave to one side . . . We have to hold on a little longer until we have the pill in our hands before we are able to increase what we eat a little bit, even if it is only two teaspoons of rice'	Woman, 48 years old, book consultant, Esmeraldas
c	'. . . so what I look at is when I go shopping, I look at what is in the food and I say, no, I can't eat it, so I have decided not to buy it, and I decided not to eat it, that is, it is all over, now when this confinement is over I am going to live a healthier life'	Woman, 48 years old, book consultant, Esmeraldas
d	'It is that this problem, the pandemic, mmm I don't think I'm the only one whose health has been damaged by the pandemic in terms of poor nutrition, because also, I think that when a person is locked up, I think that it makes them hungrier . . . No matter how much you say no, sometimes the desperation . . . the anxiety of doing nothing makes you get desperate and then you feel like eating more and when you eat a piece of fruit you see the saucepan . . . and it makes you want to eat something else. And my stall in the micro-market, I can say, it made me want to eat other things that, of course, I knew were bad for me, bad for my illness, but I ate them'	Woman, 50 years old, street vendor, Quito
e	'How has your physical activity changed as a result of confinement and why? LBC: I mean, the reason, my reason is because I can't go out, just to be here in the house, I mean, one is kind of immobilized, because of my illness, because of the fear, all that, my dear'	Woman, 63 years old, housewife, Quito

due to the lockdown and mobility restrictions. The findings are important because they coincide with severe restrictions in healthcare access and problems with medication stock in public health facilities and private pharmacies.[14] The ability to self-care one's health with diet and physical activity becomes even more important when access to health services and treatment is challenged. Here, we show that the difficulty in accessing products applied as much to food, as medication. Furthermore, participants had little opportunity to carry out physical activity, which prior to the pandemic had been covered in their jobs. Anxiety and fear also impacted negatively on people's diets and daily activities. The family emerged as a source of emotional and economic support in the absence of public social policies.

What is already known on this topic

The analysis of the policy response to the COVID-19 pandemic in low-resource countries has highlighted the lack of policies against poverty and nutrition insecurity, further intensifying the social inequalities present even before the onset of the pandemic, especially in the most vulnerable populations, women and migrants.[16,17] In this context, the presence of chronic diseases and previous infections may have increased food insecurity[18] as disruptions in the production and distribution of perishable and nutritious foods during crises limit dietary variety.[19] More nutritious and costly food groups such as pulses, nuts and animal protein are replaced by relatively nutrient-poor and cheaper staples.[20, 21]

The COVID-19 pandemic and the associated social distancing measures exacerbated pre-existing rural vulnerabilities to a greater degree in low-income countries compared to high-income ones[22] and increased hunger through inaccessibility to food.[23–25] Given the lack of institutional support, the fragmentation of health services and the inaccessibility of medication, some participants reported that controlling their diet was the only means available to them to manage

their illness. However, this was in turn difficult because of the loss of income that limited their access to food and medication, so the most vulnerable people reflected that they were struggling both with the pandemic and with hunger. In this sense, in the absence of institutional responsibility, individuals became responsible for their own care and disease management during the pandemic. A study in Chile, a country with a precarious health system, described how the care of chronic diseases in people in lower socioeconomic strata was completely neglected.[26]

The lockdown related to the COVID-19 pandemic was associated with emotional problems including anxiety, depression and sleep disturbances that led to more frequent binge eating.[27,28] Our interviewees described negative emotions such as anxiety and fear, exacerbated by the vulnerability of their chronic conditions, as stimuli to increases in portion intake, especially of carbohydrates and unhealthy foods. During the COVID-19 pandemic, in the face of loss of income, isolation and the absence of social policies, greater family cohesion, neighbourhood solidarity and organization of community networks appear as a form of resilience to cope with the increased vulnerability generated. This may play a protective role against adverse health outcomes and buffer the negative impact of the pandemic. Other studies have highlighted the importance of social capital as an important resource with the capacity to organize help and support during the COVID pandemic19.[29]

Lockdown limited the practice of physical exercise in public spaces. It should be remembered that in the poorer population, physical activity is frequently associated with work, rather than leisure-time physical activity, which is often inaccessible due to the economic cost involved.[23–25] Therefore, the loss of employment or the inability to engage in informal employment activities such as street vending was related to the cessation of physical activity in most cases.

What this study adds

People interviewed in our study, especially those living in rural and hard-to-reach areas, mentioned the difficulty purchasing and accessing food, which required long journeys and additional costs. Some of them limited themselves to consuming only what they grew on their own property. In urban and rural settings, informal sector workers had to isolate during the pandemic and were unable to earn a living, a problem that was exacerbated by their lack of sufficient resources and social protections.

Our results showed the relationship between purchasing power and people's socioeconomic and housing conditions. Residing in rural areas or in condominiums with green spaces helped to stay active because rurality offers ample natural green spaces surrounded by rivers, allowing access to other activities such as swimming, canoeing (rowing or motorized) and entering family growing plots to walk and/or work, which can compensate for smaller housing sizes. However, people living in small houses, especially in urban areas, found it more difficult to exercise during confinement, but also tried to create imaginative ways of exercising through family activities, such as walking up and down stairs or dance therapy. In this sense, socioeconomic conditions related to neighbourhoods and living environments are relevant, as they are shown to be related to physical activity in our study. In addition, there are often fewer green spaces in low-income areas compared to higher-income areas, and these are often smaller and poorly maintained.[30]

This study highlighted the limitations and difficulties in the self-management of chronic non-communicable diseases during the COVID-19 pandemic in Ecuador. Increased food insecurity and limited physical activity were marked among the most vulnerable people such as migrants and women and were coupled with the loss of income in a context of labour informality and difficulties in accessing health services and pharmacological treatment. The lack of social policies reflected the lack of social protection for people with chronic diseases who had to fight against the pandemic and hunger and placed the responsibility for care in the hands of the sick. People reported a worsening emotional state and social and family support emerged as a source of resilience and adaptation. The COVID-19 pandemic had led to a series of social crisis including health inequities in the globe, in particular low- and middle-income countries. In Ecuador, COVID-19 further intensified the social inequalities present before the pandemic by limiting access to physical activity and nutrition, key aspects in the management and control of chronic non-communicable diseases, but also in coping with emergency infectious diseases.[31]

There is a need to monitor the emerging consequences of this neglect and difficulty in chronic disease management, considering social and environmental factors and the role of resilience in this syndemic, by addressing appropriate policies that consider people from the most disadvantaged backgrounds to reduce the health inequality gap.

Limitations of this study

Our study has several limitations that must be considered when interpreting the results. On the one hand, the interviews were conducted by telephone due to the pandemic situation, which made it difficult to collect information related to non-verbal language. To counteract this, interviewers took notes on relevant information such as voice and intonation, the interviewee's mood and the context in which the interview

took place. The evidence shows that telephone interviews are an effective means of collecting information and in our study allowed us to conduct interviews in hard-to-reach areas of Esmeraldas and not only in the capital of the country.[32] Even so, we had problems reaching rural communities due to a lack of resources. This meant that people in Esmeraldas were in higher education, technical jobs and with a basic monthly salary >400$. The interviews were conducted in Spanish, which may have resulted in the loss of information on how the pandemic has affected the indigenous population in Ecuador.

Acknowledgements

We would like to thank the participants for taking part in the interviews and sharing their experiences. Furthermore, we acknowledge the work of the interviewers who collected the data and the help of the diabetes clubs and CECOMET for recruiting the participants of the study.

Supplementary data

Supplementary data are available at the *Journal of Public Health* online.

Conflict interest

The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analyses or interpretation of data; in the writing of the manuscript or in the decision to publish the results.

Funding

This research was funded by a H2020 European Research Council 2018 Starting Grant, grant number 804761—CEAD.

Data availability

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

The study was approved by the Ethics Committee of the Hospital Universitario Sant Joan and Human Research Ethics Committee of Pontifical Catholic University of Ecuador. Informed consent was obtained from all participants, ensuring confidentiality and the use of information exclusively for research purposes. At the beginning of the interview, the informed consent form was read, and the participant verbally agreed to participate. Both the verbal informed consent and the interview were recorded to facilitate later analysis. Participation in the study was voluntary and there were no material incentives.

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