

BMJ Open Patients' and healthcare providers' perspectives of diabetes management in Cambodia: a qualitative study

Ei Ei Khaing Nang ¹, Chhavarath Dary,² Li Yang Hsu,¹ Sokrath Sor,³ Vonthanak Saphonn,² Konstantin Evdokimov¹

To cite: Nang EEK, Dary C, Hsu LY, *et al.* Patients' and healthcare providers' perspectives of diabetes management in Cambodia: a qualitative study. *BMJ Open* 2019;**9**:e032578. doi:10.1136/bmjopen-2019-032578

► Prepublication history and additional material for this paper are available online. To view these files, please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2019-032578>).

Received 26 June 2019
Revised 07 October 2019
Accepted 21 October 2019



© Author(s) (or their employer(s)) 2019. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

¹Epidemiology Domain, Saw Swee Hock School of Public Health, National University of Singapore, Singapore, Singapore
²University of Health Sciences, Phnom Penh, Cambodia
³Center for Livestock and Agriculture Development (CelAgrid), Phnom Penh, Cambodia

Correspondence to
Dr Ei Ei Khaing Nang;
nangeiei.khaing@nih.gov

ABSTRACT

Objective This study aimed to explore the challenges encountered by patients and healthcare providers and opportunities for improvement in managing diabetes mellitus (DM) in a low- and middle-income country (LMIC) facing a rise in DM prevalence.

Design Qualitative cross-sectional study.

Setting Urban, semiurban, and rural areas in Cambodia.

Participants Thirty health service providers and fifty-nine adult DM patients.

Results Most of the 59 DM patients reported having developed DM complications when they first sought treatment. The biggest challenges for the patients were geographical barriers, diet control, and shortage of medication supply. The healthcare staff expressed concerns about their limited knowledge and lack of confidence to treat diabetes, limited availability of diabetes care services, inadequate laboratory services, shortage of staff, poor patients' compliance, and insufficient medication supplies. Both healthcare staff and patients urged an expansion of diabetes services in Cambodia and prioritisation of diabetes care in a manner similar to communicable disease control programmes of the recent past.

Conclusions Currently, the Cambodian healthcare system has very limited capacity to provide quality care for chronic diseases. As a consequence, many patients are either left untreated or have interrupted care due to several barriers including financial, geographical, and lack of knowledge and skills. A more comprehensive and multipronged approach is urgently needed to improve DM care, which would require a collaborative effort from government, external funding agencies, private sector, and communities.

INTRODUCTION

Prevalence of diabetes mellitus (DM) is alarmingly increasing worldwide with approximately 425 million adults living with and 352 million at risk of developing type 2 diabetes in 2017.¹ The International Diabetes Federation (IDF) projected 629 million diabetics in 2045 and considered diabetes one of the largest global health emergencies in the 21st century.¹ Seventy-nine per cent of adults with diabetes live in low- and middle-income countries (LMICs), while south-east

Strengths and limitations of this study

- Views of patients and healthcare providers from both public and private healthcare sectors allowed the triangulation of the diverse perspectives on diabetes management.
- Different levels of healthcare system including national, provincial, and district level were covered.
- The study was conducted in diverse geographical regions of Cambodia including the regions near the border and geographically isolated areas.
- Most of the patient participants were recruited at the hospitals or through service providers; hence, diabetes patients who did not have access to these health services may have been missed.

Asia and western Pacific regions are at the epicentre of the diabetes crisis.

Cambodia located in the IDF Western Pacific region is facing double burden of communicable diseases and non-communicable diseases (NCDs). The mortality due to ischaemic heart disease and stroke increased between 2000 and 2012 leading them into top three causes of death in Cambodia.² The prevalence of impaired fasting glycaemia and diabetes have dramatically increased from 1.4% and 2.9% in 2010³ to 8.9% and 9.6% in 2016.⁴ A modelling study based on STEPS Survey 2010 data projected a 10% increase of type 2DM prevalence (80% increase in absolute numbers) in the population older than 35 years of age in Cambodia by 2028.⁵ Remarkably, the percentage of diabetes-related premature deaths and the prevalence of undiagnosed DM in Cambodia is higher than in most other countries.¹ It has been reported that more than 50% of persons with DM in Cambodia were not treated⁶ while there was a high prevalence of complications such as renal failure in people with DM.⁷ The socioeconomic burden of DM in Cambodia is substantial with a clear upward trend⁵ but the health system has been traditionally oriented

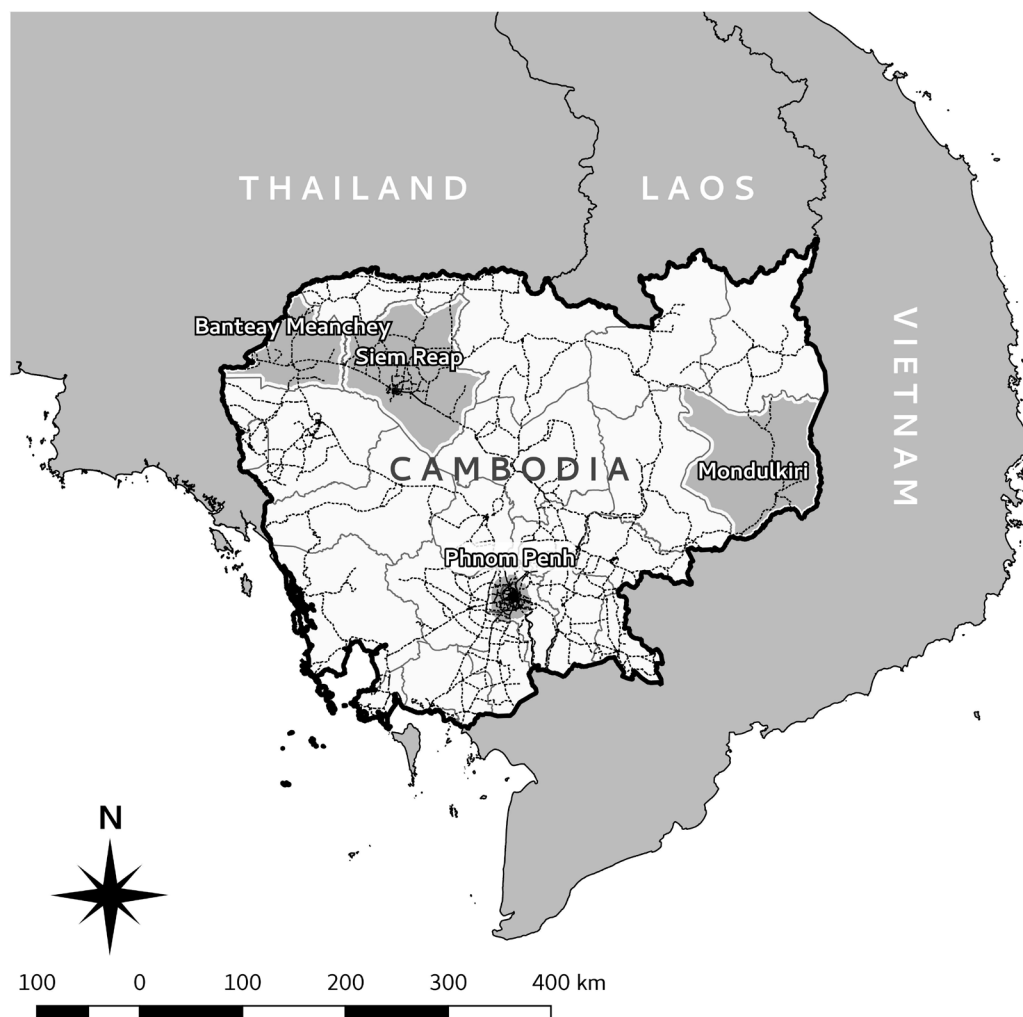


Figure 1 A map depicting the four study sites in Cambodia.

towards communicable diseases control and may not be ready to cope with the rising burden of NCDs.⁸

In order to formulate effective policies and interventions, it is imperative to understand the challenges and opportunities of managing DM in the local population. However, these have not been addressed in Cambodia in depth yet. Here we report patients' and health service providers' perspectives of managing DM in Cambodia.

MATERIALS AND METHODS

Research design

This qualitative cross-sectional study addressed the perspectives of patients and healthcare providers in managing diabetes in Cambodia.

Sampling

Four provinces of Cambodia: Phnom Penh (capital of the country), Siem Reap and Banteay Meanchey (north-west of the country), and Mondulkiri (east of the country) (figure 1) were selected based on the level of urbanicity, geographic location, and feasibility.

Eligibility criteria

Healthcare providers were eligible to participate in in-depth interviews (IDIs) if they had at least 1 year of experience in providing care for diabetes/chronic diseases. Any individual aged 21 years and above, diagnosed with DM with or without complications and/or with any duration of the disease since diagnosis was considered an eligible patient for focus group discussions (FGDs).

Data collection

To achieve maximum variation, we interviewed 30 healthcare providers at the national, provincial, and district level and peer educators of a local non-governmental organisation (NGO) providing DM service.

Healthcare staff helped the research team in recruiting DM patients for FGDs as follows. The study was presented to the healthcare staff of the participating institutions, peer educators and community leaders, whereupon they disseminated the information about the study among their patients or communities. Individuals who expressed interest to participate attended information sessions organised by the study team and later joined focus group

discussions. In total, 59 eligible adults attended seven FGDs in groups of 5–10 patients.

Semistructured interview guides were used to facilitate IDIs and FGDs (online supplementary files 1 and 2). The interviews were conducted in Khmer by trained researchers.

Data analysis

Bilingual research staff transcribed all interviews verbatim and translated them into English. We used both inductive and deductive approaches when analysing the data. Inductive analysis was used in the early stage to explore the ideas and meanings contained in the raw data and to identify concepts, patterns and themes. Similar codes were collated to form initial themes. Once patterns, themes and subthemes were established by open coding, deductive content analysis was used to validate these in an iterative process. We reported the results in patient-based, provider-based and health-system-based issues. QSR NVivo V.11 for Windows was used to manage the data.

Figure 1 illustrating the study sites was produced with QGIS 2.14.9-Essen. Administrative areas level 0 and 1 for Cambodia, Thailand, Laos and Vietnam (solid lines) were downloaded from the Database of Global Administrative Areas. The roads data (dotted lines) were obtained from the OpenStreetMap Data Extracts.

Ethics considerations

Written informed consent was obtained prior to enrollment in the study. Participants were provided with a symbolic token of appreciation for their time.

Patient and public involvement

We did not involve patients or the public in our work.

RESULTS

Characteristics of participants

The IDIs participants were represented by approximately equal proportions of doctors and nurses from public sector with a few peer educators from NGO (table 1). Seventy-three per cent had received diabetes training with 33% having received the training in the past 6 months prior to the interview.

Most of the FGD participants were farmers and housewives (table 2). Half of the participants had been diagnosed with DM at least 5 years ago, and most reported having known complications associated with DM.

Patients' experiences and perspective

DM diagnosis and feelings associated with it

Patients in our FGDs had suffered from symptoms such as fatigue, frequent urination, blurred vision, and numbness in hands and feet for a few months to years before they finally sought medical help. Most patients went to private clinics for their initial check-up while a minority were referred to public hospitals by other DM patients in their community who recognised their symptoms. A

Table 1 Characteristics of in-depth interview participants

Age (median, min–max)	35 (24–60)
Gender (N, %)	
Male	21 (70.00)
Female	9 (30.00)
Education (N, %)	
Primary school	2 (6.67)
Secondary school	2 (6.67)
High school/professional technical training	6 (20.00)
University/post-graduate	20 (66.67)
Profession (N, %)	
Doctor	14 (46.67)
Nurse	12 (40.00)
Peer educator	4 (13.33)
Year of work in DM care (N, %)	
0 to <1 year	4 (16.67)
1–5 years	11 (36.67)
5–10 years	9 (30.00)
>10 years	5 (16.67)
Number of patients treated in the past 6 months (N, %)	
0 to <10	4 (13.33)
10 to <40	7 (23.33)
>40	19 (63.33)
Received DM training	
Yes	22 (73.33)
No	8 (26.67)
Received DM training in the past 6 months (N, %)	
Yes	10 (33.33)
No	20 (66.67)
Level of healthcare providers (N, %)	
National level hospital	7 (23.33)
Provincial hospital	9 (30.00)
District hospital	10 (33.33)
Peer educator network	4 (13.33)

DM, diabetes mellitus.

few patients were diagnosed at the time of hospitalisation with serious DM complications.

I didn't know I had diabetes and then in the evening I felt dizzy and fell in coma. Then I was taken to the hospital. But it was a private Clinic called xxx that tested my blood sugar. They told me that I had high sugar. So, I decided to buy drugs for high sugar... (Female, semiurban, PS04)

Most patients reported that they were scared and felt hopeless when they learnt their diagnosis, as they associated

Table 2 Characteristics of focus group participants

Age (median, min–max)	56 (33–73)
Gender (N, %)	
Male	14 (25.45)
Female	41 (74.55)
Education (N, %)	
Primary school	31 (56.36)
Secondary school	10 (18.18)
High school	4 (7.27)
Post-graduate (Master/PhD)	1 (1.82)
Other*	9 (16.36)
Ethnic (N, %)	
Khmer	54 (98.18)
Cham	1 (1.82)
Marital status (N, %)	
Married	39 (70.91)
Unmarried	4 (7.27)
Divorced	1 (1.82)
Widowed	11 (20.00)
Employment status (N, %)	
Employed	2 (3.64)
Unemployed	10 (18.18)
Housewife	10 (18.18)
Farmer	20 (36.36)
Unskilled worker	1 (1.82)
Daily wages	4 (7.27)
Student	8 (14.55)
Household income (N, %)	
No defined income	11 (20.00)
Irregular income	33 (60.00)
Regular income	11 (20.00)
Time since diagnosis of diabetes mellitus, years (median, min–max)	5 (0.002–23)
Time on treatment for diabetes mellitus, years (median, min–max)	4 (0.002–20)
Having diabetes complication (N, %)	48 (87.27)
Regular visit to clinic/hospitals (N, %)	42 (76.36)

*Other=no formal education.

DM with severe outcomes such as amputations and death. Some patients said they were determined to fight it.

I don't want other people to know, actually that feeling, we don't want anyone to know, but our family, our wife, we don't hide, ... we are very scared, diabetes is a disease, I can see arms and legs amputations... (Male, urban, PP01)

Talking about feeling, from rumours I heard any DM patients cannot survive; I felt quite hopeless but if there was medication for DM for me to take, I had

to use it regularly to fight against this disease, if I die even if I take the medication, I won't regret. (Female, rural, PB06)

DM treatment and traditional medicine use

Some participants were treated at private clinics first and then switched to public hospitals when they thought that the treatment was ineffective. There were only a few participants who sought initial treatment in the public sector.

Previously I bought medication from the pharmacy. When it got serious, I seek the doctor. (Male, rural, PB06)

Patients in Phnom Penh reported that they did not believe in using traditional medicine to control DM. However, most participants living in the provinces said that they took traditional medicine concurrently with DM medication prescribed by the doctors as they believed that a combination of these two would be more effective in controlling their blood glucose. Most traditional medicines consumed included herbs such as *Morinda citrifolia*, *Ziziphus cambodiana*, *Elephantopus scaber*, *Syzygium cumini*, *Plukenetia volubilis* and *Azadirachta indica*.

I think I should use apart from traditional and apart from modern (laughing) because people told me I should do that. So, every day I ask someone whom I know to buy "Sdav" (*Azadirachta indica*) bark for me. (Female, rural, PB07)

Living with diabetes in the community

Patients expressed that living with diabetes was a huge burden for them as their lives changed for worse.

We are afraid of falling, injury or cut, we are afraid, overall people who have diabetes have a huge burden from safeguarding themselves, from taking medication regularly, coming to the hospital regularly, exercise and diet, dieting, there are many. We were not like this before we were ill, we go to the restaurant we can eat anything, eight dishes, we can eat nine dishes, it is fine, but now we cannot, we diet, ... it is something difficult. (Male, urban, PP01)

Most patients said there was no discrimination against them and the community felt pity for them.

Some people in the community feel pity for us, we are not discriminated as HIV patients. They feel condolences for us because diabetes cannot be cured. (female, urban, PP02)

Only a few reported that they had encountered discrimination.

Yes. They are afraid of transmission; they don't even come to ask you how you are, they stop coming to drink water at your house, they walk away from us. (Male, semiurban, PS04)

Table 3 Summary of codes and quotations of patients' and health-providers' perspectives in diabetes management

	Patients' perspective	Health-providers' perspective
Patient level	<p><i>Self-management</i> 'In my body, I find that I cannot control my eating; for example, the doctor told me that I can eat the banana and other food but when eaten, my blood sugar rises at the level higher than it was when coming to see him. So, controlling your diet is the hardest to manage.' (Male, rural, PB06)</p> <p><i>Distance and transportation</i> 'Traveling by car took the whole morning and whole afternoon almost a whole day; then when arriving there, waiting to receive the service there was also the whole day. I went there, I waited for the doctor since morning until around 2–3 pm that I received the treatment.' (Male, rural, PB07)</p>	<p><i>Self-management</i> '... Patient has difficulty using insulin on their own, ... the difficulty is that their diet is not appropriate, and their usage of insulin is not appropriate'. (HP04, nurse, urban area) 'The challenge with the patient is that they don't manage themselves appropriately, they leave their health to a difficult stage, the most difficult stage, so it is also difficult for the doctor too.' (HP04, nurse, urban area)</p>
Health-provider level	<p><i>Medication supply</i> 'When I run out of medication, I go there for nothing and I just have medication left for 1 or 2 days more and not seeing them or no stock wait sometimes until next week, so my daily treatment is interrupted. So, my request is to supply drugs regularly, it will be good because if we don't take medication regularly, we feel unwell.' (Female, urban, PP02)</p>	<p><i>Medication supply</i> 'For example, a patient lives far, sometimes the hospital supplied them two weeks. They run out of medication, they don't have the fee to come and pick up the medication, so err, at the district hospital or the health centre near their home should have this medication for them to access.' (HM10, nurse, rural) <i>Limited knowledge and skills</i> 'I am a doctor, but I am not specialized in this field. I only look after minor illnesses, in case of severe diabetes, I am afraid to treat.' (HP11, medical doctor, rural) <i>Limited Laboratory service</i> 'Blood monitoring such as examining A1c haemoglobin is not available because we don't have a laboratory.' (HS18, nurse, semiurban) <i>Shortage of staff</i> 'The challenges in providing service, the most important one is that our resources are limited. There are not many people working, so the quality of counselling, the quality of the provision is limited. (HS13, medical doctor, semiurban)</p>
Health-system level		<p><i>Lack of diabetes services</i> They [the patients] come to seek us, and we refer them, this means that we have failed, this means that we have failed. ... they will seek the Khmer medication'. (HB28, medical doctor, rural)</p>

Challenges

The challenges encountered by patients are summarised in [table 3](#).

Patient level

Diet

The majority of patients reported that the most challenging factor for them was controlling their diet. Some participants even thought that diabetes was worse than HIV as they could not eat as much as they desired.

In my body, I find that I cannot control my eating; for example, the doctor told me that I can eat the banana and other food but when eaten, my blood sugar rises at the level higher than it was when coming to see him. So, controlling your diet is the hardest to manage. (Male, rural, PB06)

...diabetes personally is more difficult than AIDS. People with AIDS can eat, don't have any side effect,

have a long life. On the other hand, diabetes, if you eat, you will have a short life. (Female, urban, PP02)

Patients also have the perception that they would have less energy if they ate less. Hence, patients complained that it was a significant challenge for them to properly balance between these two; gaining energy and controlling blood glucose.

If we eat much, we can have power but eating much increases blood sugar and the DM symptoms occur; eating less, we are less energetic. (Female, semiurban, PS05)

Distance and transportation

For patients attending FGDs, especially those who lived far from the hospitals or those who have to get treatment in other district hospitals, travelling and transportation expenses outweighed the cost of medications.

Traveling by car took the whole morning and whole afternoon almost a whole day; then when arriving there, waiting to receive the service there was also the whole day. I went there, I waited for the doctor since morning until around 2–3 pm that I received the treatment.... (Male, rural, PB07)

Health-provider level

Medication supply

The next challenging factor for patients was irregular or short-term medication supply. Most hospitals were only able to provide 2–4 weeks of medication per visit and it was difficult for patients, especially those from the provinces, to travel to the hospitals regularly to get the medications. Sometimes there was a medication shortage at the hospitals. Some patients used traditional medicine as an interim measure when there was a shortage of medication.

When I run out of medication, I go there for nothing and I just have medication left for 1 or 2 days more and not seeing them or no stock wait sometimes until next week, so my daily treatment is interrupted. So, my request is to supply drugs regularly, it will be good because if we don't take medication regularly, we feel unwell. (Female, urban, PP02)

I used traditional medicine when there was no medication from “xxx” yet. When there was no medication from “xxx”, everyone used traditional medicine. (Female, rural, PB06)

Health providers' perspective

All healthcare providers we interviewed recognised the rising burden of DM and the challenges it poses to the healthcare system. They mentioned it was quite common to see DM patients with complications and the most common complications were renal dysfunction, diabetic eye disease, and foot ulcers. The challenges and quotations are summarised in [table 3](#).

CHALLENGES

Patient level

Poor self-management and compliance of patients

Patient's poor self-management was a challenging factor for healthcare staff.

The challenge with the patient is that they don't manage themselves appropriately, they leave their health to a difficult stage, the most difficult stage, so it is also difficult for the doctor too.

...Patient has difficulty using insulin on their own, ... the difficulty is that their diet is not appropriate, and their usage of insulin is not appropriate. (HP04, nurse, urban area)

Health- provider level

Limited knowledge and skills

Many healthcare staff at the provincial and district hospitals expressed concerns about their limited knowledge

and lack of confidence to treat DM, especially those with complications.

I am a doctor, but I am not specialized in this field. I only look after minor illnesses, in case of severe diabetes, I am afraid to treat. (HP11, medical doctor, rural)

Limited medication supply

Generally, public hospitals were supplied with medicines every quarter. However, the supply was usually not sufficient to cope with the patients' needs and the hospitals had to purchase the medicines with hospital funds or encourage patients to buy their medications at the private pharmacies. Due to limited supply, some hospitals could only provide a 1-week or 2-week supply of medicines to patients. Moreover, the variety of antidiabetic drugs available at most hospitals was also limited. Some hospitals had only one type of antidiabetic drug (metformin) and most hospitals did not stock insulin. The healthcare staff consistently mentioned that insufficient supplies and limited variety of antidiabetic drugs impacted proper DM care.

For example, a patient lives far, sometimes the hospital supplied them two weeks. They run out of medication, they don't have the fee to come and pick up the medication, so err, at the district hospital or the health centre near their home should have this medication for them to access. (HM10, nurse, rural)

In our hospital, we have a shortage of medication, for some patients who arrived with hyperglycaemia, it is difficult for us because, to be specific, we have insulin shortage. We don't have anything to lower it. We only have oral medication like Glibenclamide, Metformin and, for injection, we only have intermediate-acting insulin. We don't have the rapid-acting insulin, so we are worried about this illness. If a diabetes patient with hyperglycaemia gets a coma, it is difficult for us. It causes concern among us. (HM-11, medical doctor, rural)

Limited laboratory service

Another challenge for the healthcare staff was the inability to properly monitor patients' conditions due to inadequate laboratory facilities. Most hospitals did not have laboratory equipment to test Glycated haemoglobin A1C (HbA1c).

... we treat diabetes too, but we do not have a “diabetes specialist” (endocrinologist). Blood monitoring such as examining A1c haemoglobin is not available because we don't have a laboratory. And the medication specializes in lowering the blood glucose. We don't have a lot of kinds of medication. We only have Glibenclamide and Metformin. (HS18, nurse, semiurban)

Shortage of staff

Majority of healthcare staff mentioned the current manpower was insufficient to cope with the increased

numbers of patients and thus this subsequently affected the quality of care.

The challenges in providing service, the most important one is that our resources are limited. There are not many people working, so the quality of counselling, the quality of the provision is limited. (HS13, medical doctor, semiurban)

Health-system level

Limited effective coverage of diabetes services

DM services are available at national hospitals, provincial hospitals, and few district hospitals. Some district hospitals in our study did not have diabetes service and clinicians expressed frustration about the need to refer diabetes patients to other hospitals with diabetes services.

They [the patients] come to seek us, and we refer them, this means that we have failed, this means that we have failed. ... they will seek the Khmer medication. (HB28, medical doctor, rural)

They are poor. When we need to refer them, it is around 40 to 50 km from their home. If they get treatment near their home, their wife or children could cook rice for them or cook in the hospital, they spend less. But if they go there, they have to spend more. Because they decided that they don't go, they don't attend the counselling, we explain. We are out of options; we cannot send a sick patient who is about to die home. At least we have a doctor to treat. (HB28, medical doctor, rural)

OPPORTUNITIES FOR IMPROVEMENT

Staff training, medication supply and health education/counselling for patients consistently came up at the top of the list of suggested measures to improve DM management.

Patient level

Health education and counselling

Patients and healthcare providers expressed the need for more health education. Healthcare staff acknowledged that they were not able to provide adequate health education to patients due to lack of time and manpower and wished that dedicated staff be available to conduct regular health education sessions for patients. Both healthcare staff and patients provided the same opinion that patients need to get frequent health education sessions as patients cannot remember the information if they hear it only once or twice. Dietary counselling is another area of opportunity for improving DM care as diet control is the most challenging factor for patients and yet there is no proper dietary counselling. Patients reported that information, education and communication materials (even a food chart poster) would be helpful in providing guidance for diet control. In addition, mental health counselling should be made available for DM patients as some reported depression, insomnia, and fears of amputation

and death. This is consistent with findings from another study done in Cambodia.⁹ Although only a few patients reported stigmatisation, more people are potentially exposed to the threat of discrimination because their condition in Cambodian context might be mistaken for stigmatised infectious diseases such as tuberculosis (TB) or HIV. In a study done by Jacobs *et al*, the initial discrimination from the community changed to sympathy once the disease was confirmed to be DM/hypertension.⁹

Financial protection for patients

The coverage by social protection schemes remains low in Cambodia. Health Equity Fund (HEF) provides fee waiver only for extremely impoverished individuals that is for approximately 2.6million people, less than one-fifth of the total population.¹⁰ Those who are not eligible for HEF subsidy can hardly afford lifelong treatment for a chronic condition. According to earlier reports some patients had to sell their land and other properties in order to finance their treatment.¹¹ In our study, financial ability affects both patients' choices and the treatment prescription by the healthcare professionals. Medical doctors reported that the treatment options were often constrained by the financial ability of patients. They suggested that financial protection mechanisms, such as health insurance, should be established to minimise the financial impact on patients as well as to allow healthcare professionals to choose optimal treatment for patients without concerns for the financial burden on patients.

Health-provider level

Staff training

Healthcare staff in both urban and rural areas expressed the need for training. A DM specialist in the urban area mentioned that the emphasis should be given to the healthcare staff in the rural areas as he had seen patients from rural areas with severe DM complications that could have been prevented if the staff in the rural area had been equipped with knowledge and skills to treat DM. Although the curriculum for medical and nursing students covers diabetes management, general practitioners and nurses do not have confidence to treat diabetes patients, especially those with complications, and wish to have a specialised training in DM care. Limited knowledge in DM care appeared common in both public and private sectors. Patients reported that some doctors at the private clinic lacked knowledge and skills to treat diabetes and yet they did not refer patients to appropriate healthcare services until patients left them due to ineffective treatment. Thus, training on DM care, as well as continuing medical education programme, are much needed for healthcare professionals in Cambodia.

Regular supply of medication

Another area of opportunities to improve is to supply diabetes medication to health services in public sector regularly and sufficiently. Both patients and healthcare staff urged uninterrupted supplies of DM medicines. The



interruption in the medication supply as well as the short-term 1-week or 2-week supply of medication affected the compliance of patients. Providing medication regularly for a longer period of time would tremendously reduce this burden and improve patients' compliance. Peer educator network partners with pharmacies to provide medicines at a reduced price.¹⁰ Although it is still higher than the subsidised price in the public sector, this may be a more sustainable solution to provide a steady supply of medicines. This may also reduce travel cost as the pharmacies are located closer to patients than referral hospitals are.

Health-system level

Coverage of DM service

Increasing effective coverage of the DM service is critical to the reduction of the geographical and financial barriers for the patients to access care. Currently, only very few district hospitals provide comprehensive DM services and patients have to travel to provincial or national hospitals in order to get proper treatment. Some healthcare staff suggested utilising mobile technology to reduce the need to travel. In the Text Messages Support for Diabetes Self-Management Study in the Democratic Republic of Congo, Cambodia and the Philippines, an increased interaction between patients and healthcare providers was reported at 1 year assessment.¹² However, at the end of the 2-year intervention, no significant effects of the intervention were observed. Moreover, several indicators including frequency of contact with educators and the number of participants with controlled diabetes ($HbA1c < 7\%$) worsened during the study period in Cambodia.¹³ Nonetheless, this finding should not discourage healthcare providers to develop new and innovative methods of care delivery harnessing mobile technologies.

Setting diabetes as a priority

Both healthcare staff and patients suggested that DM should be declared a national priority like TB or HIV infection, and that this could help to reduce the burden of the disease. A healthcare staff said 'An important factor is to set diabetes as a priority like other diseases as well, it is an important disease. Because from my experience, when our ministry sets a disease as a priority, when we put effort into it, sooner or later that disease begins to decrease including AIDS, TB, and Hansen's disease.' A previous study in Cambodia reported that some patients even wished they had HIV/AIDS rather than diabetes due to subsidy given to HIV/AIDS patients.¹¹ Patients perceived that the cost of diabetes treatment would be subsidised like HIV/AIDS if it was made a national priority.

DISCUSSION

In this study, we discovered the challenges faced by healthcare providers and patients in dealing with DM in Cambodia. The top one cited by both patients and providers was that of insufficient medication supply. Other challenges for patients included the inability to

properly control their diet followed by the barriers to accessing DM services. Health providers cited limited practical knowledge of treatment options for complications of DM, shortage of manpower, inadequate laboratory services, and poor patient compliance as additional challenges. Suggestions to improve DM care included health education and dietary counselling for patients, training for healthcare staff, increasing effective coverage of DM service, and advocacy for prioritising DM care. Some of the reports by diabetes patients in our study align with findings in other LMICs.¹⁴ In Bangladesh, the barriers to receiving optimal care included lack of access to adequate care, limited knowledge of medical practitioners, and financial constraints.¹⁴ Like in Cambodia, subdistrict hospitals in Bangladesh did not have the ability to provide diagnostic service and patients had to travel to specialist hospitals for diagnosis and care and even needed to travel further to the capital, Dhaka, to receive comprehensive check-up and care for diabetes complications.¹⁴ Thus, travelling cost in addition to medication cost imposed a huge burden on patients affecting their ability to seek care. Even in the highly subsidised healthcare system in Malaysia, lack of affordable transport is a critical barrier to healthcare.¹⁵ In our study, patients in public sector reportedly spent ~US\$12 per month for diabetes medicines and ~US\$25 if they required medicines for other co-morbidities. The cost is double in the private sector. The transportation costs range from US\$2.5 to US\$7.5 per visit. Thus, the total treatment costs could amount to US\$30–50 per month depending on the number of visits required to collect medication. The average monthly household income in Cambodia is approximately US\$116. Hence, it is a huge burden for patients especially those who need to travel far to get medication. Enhancing the capacity of the existing health centres to provide the minimum standard of care for DM patients may address this issue as health centres are geographically more accessible to patients. Currently the health centres staffed predominantly with nurses or midwives are not able to provide full diabetes care as only medical doctors can establish definitive diagnosis and initiate treatment. A nursing model enhanced with mHealth technology may offer a solution. Diabetes point-of-care devices could be used to transfer real time data to physicians, allowing physicians to monitor patient's conditions and adjust treatment¹⁶ while nurses at health centres could implement the physician's recommendations delivered with mHealth technology. Point-of-care service model of management of chronic disease conditions has been tested and found to be feasible and acceptable in other LMICs.¹⁷

Recognising the need to improve DM care, there are some interventions being piloted or implemented in Cambodia. The Ministry of Health has established and implemented chronic disease clinics (CDC), peer educator network, and the WHO package of essential non-communicable disease interventions in selected operational districts.⁸ As the HIV/AIDS service has

well-established resources and networks, the feasibility of integrating services for these two chronic diseases (DM and HIV/AIDS) was tested in CDC and it was demonstrated to be a promising model for improving outcomes and increasing efficiency in healthcare delivery.¹⁸ It was also shown to reduce HIV-related stigma. However, there is no proper evaluation of intake among diabetes patients. It is pertinent to assess this before scaling up the intervention as diabetes patients may not want to be mistaken for having HIV in fear of stigma.

MoPoTsyo, a local NGO, uses a peer educator system to provide education, screening, and treatment for DM and hypertension in a few provinces with limited resources, which improved outcome indicators of DM care (fasting blood glucose and blood pressure).¹⁹ Patients perceived peer educators more accessible and willing to spend more time to provide counselling/education.

Although the aforementioned interventions have shown some promises, they are only able to provide care for uncomplicated DM. There was still a need to refer to national hospitals for DM with complications. Moreover, currently provincial and district hospitals do not have systematic screening or treatment facilities for complications such as diabetic retinopathy (DR), chronic kidney disease, and foot ulcers.²⁰ The prevalence of DR is estimated at 30% and reduced renal function was found in 56% of DM patients in Cambodia.^{7 20} Hence, in addition to strengthening preventive services and a minimum standard of care for diabetes, there is also a need to improve the capacity for secondary and tertiary care.

However, Cambodia has many priorities competing for its limited resources²¹ and it is an uphill task for Cambodia to face these challenges alone. Currently, the donor agencies have focused their attention on infectious diseases and there are very few organisations providing aid for NCDs. Hence, donor agencies need to recognise the rising burden of NCDs in developing countries and contribute to fighting it. Partnering with private sector may also be a potential way to increase the coverage of DM services and improve DM care delivery. Public–private partnerships (PPP) to strengthen health system received a lot of attention in LMICs.²² Cambodia has already implemented PPP model in other sectors such as transport, water and power sector.²³ In light of our findings, an extension of PPP framework to DM, and broader to NCDs services in Cambodia appears worth a consideration.²³

LIMITATIONS

Most of the patients in this study were recruited at the hospitals or through the service providers; hence, DM patients who did not have access to these health services may not be included in this study. However, we managed to include DM patients from different geographical regions of Cambodia including the regions near the border and geographically isolated areas. In addition, we were able to triangulate the perspectives of patients and health service providers in diabetes care.

CONCLUSION

Currently, the Cambodian healthcare system has very limited capacity to provide quality care for DM. As a consequence, a considerable number of patients are either left untreated or have interrupted care due to several barriers including financial, geographical, and lack of knowledge and skills. Although some diabetes care models are piloted and implemented on a small scale, there has been no proper evaluation and comparison of these activities. Moreover, these activities only cover basic diabetes care and may not address the needs of a significant proportion of DM patients who have already developed complications. In addition, there was no financial protection for long term outpatient care. Hence, a more comprehensive and multipronged approach is needed to improve DM care, which would require a collaborative effort from government, external funding agencies, private sector, and communities.

Acknowledgements We would like to thank all the participating healthcare institutions and participants in this study.

Contributors EEKN was responsible for the conceptualisation and design of the study, data collection, statistical analysis and drafting the manuscript. CD, LYH, SS, VS and KE contributed to study design. CD and SS were involved in data collection. CD and KE helped with data analysis. All authors contributed equally to interpretation of the results, critically reviewed the manuscript and approved the final version.

Funding This work was funded by the UHS-SSHSPH Integrated Research Programme and Infectious Diseases Programme at the Saw Swee Hock School of Public Health at the National University of Singapore.

Disclaimer This article was prepared while Nang Ei Khaing was employed at the National University of Singapore. The opinions expressed in this article are the author's own and do not reflect the view of the National Institutes of Health, the Department of Health and Human Services, or the United States government.

Map disclaimer The depiction of boundaries on this map does not imply the expression of any opinion whatsoever on the part of BMJ (or any member of its group) concerning the legal status of any country, territory, jurisdiction or area or of its authorities. This map is provided without any warranty of any kind, either express or implied.

Competing interests None declared.

Patient consent for publication Not required.

Ethics approval Ethics approvals were obtained from the National University of Singapore Institutional Review Board (S-17-293), Singapore and the National Ethics Committee for Health Research, Cambodia (199NECHR).

Provenance and peer review Not commissioned; externally peer reviewed.

Data availability statement All data relevant to the study are included in the article or uploaded as supplementary information.

Open access This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

ORCID iD

Ei Khaing Nang <http://orcid.org/0000-0002-5361-0481>

REFERENCES

- 1 International Diabetes Federation. *IDF diabetes atlas*. 8th edn, 2017. <https://www.idf.org/e-library/epidemiology-research/diabetes-atlas>
- 2 Organization WH. Cambodia: WHO statistical profile, 2015. Available: <http://www.who.int/gho/countries/khm.pdf?ua=1>

- 3 University of Health Sciences, Ministry of Health. *Prevalence of non-communicable disease risk factors in Cambodia. STEPS survey country report 2010*. Phnom Penh: Royal government of Cambodia, 2011. https://www.who.int/ncds/surveillance/steps/2010_STEPS_Report_Cambodia.pdf
- 4 University of Health Sciences, Ministry of Health. Prevalence of non-communicable disease risk factors in Cambodia. STEPS survey country report, 2016. Unpublished.
- 5 Flessa S, Zembok A. Costing of diabetes mellitus type II in Cambodia. *Health Econ Rev* 2014;4:24.
- 6 Otgontuya D, Oum S, Buckley BS, *et al*. Assessment of total cardiovascular risk using WHO/ISH risk prediction charts in three low and middle income countries in Asia. *BMC Public Health* 2013;13:539.
- 7 Thomas B, van Pelt M, Mehrotra R, *et al*. An estimation of the prevalence and progression of chronic kidney disease in a rural diabetic Cambodian population. *PLoS One* 2014;9:e86123.
- 8 Jacobs B, Hill P, Bigdeli M, *et al*. Managing non-communicable diseases at health district level in Cambodia: a systems analysis and suggestions for improvement. *BMC Health Serv Res* 2016;16:32.
- 9 Jacobs B, Men C, Bigdeli M, *et al*. Limited understanding, limited services, limited resources: patients' experiences with managing hypertension and diabetes in Cambodia. *BMJ Glob Health* 2017;2.
- 10 Bigdeli M, Jacobs B, Men CR, *et al*. Access to treatment for diabetes and hypertension in rural Cambodia: performance of existing social health protection schemes. *PLoS One* 2016;11:e0146147.
- 11 Men C, Meessen B, Mv P, *et al*. "I Wish I Had AIDS": A qualitative study on access to health care services for HIV/AIDS and diabetic patients in Cambodia. 2012 2012;2:18.
- 12 Van Olmen J, Van Pelt M, Malombo B, *et al*. Process evaluation of a mobile health intervention for people with diabetes in low income countries – the implementation of the TEXT4DSM study. *J Telemed Telecare* 2017;23:96–105.
- 13 Van Olmen J, Kegels G, Korachais C, *et al*. The effect of text message support on diabetes self-management in developing countries – A randomised trial. *J Clin Transl Endocrinol* 2017;7:33–41.
- 14 Lewis CP, Newell JN. Patients' perspectives of care for type 2 diabetes in Bangladesh –A qualitative study. *BMC Public Health* 2014;14:737.
- 15 Risso-Gill I, Balabanova D, Majid F, *et al*. Understanding the modifiable health systems barriers to hypertension management in Malaysia: a multi-method health systems appraisal approach. *BMC Health Serv Res* 2015;15:254.
- 16 Matteucci E, Giampietro O. Point-Of-Care testing in diabetes care. *Mini Rev Med Chem* 2011;11:178–84.
- 17 Saldarriaga EM, Vodicka E, La Rosa S, *et al*. Point-Of-Care testing for anemia, diabetes, and hypertension: a Pharmacy-Based model in Lima, Peru. *Ann Glob Health* 2017;83:394–404.
- 18 Janssens B, Van Damme W, Raleigh B, *et al*. Offering integrated care for HIV/AIDS, diabetes and hypertension within chronic disease clinics in Cambodia. *Bull World Health Organ* 2007;85:880–5.
- 19 Taniguchi D, LoGerfo J, van Pelt M, *et al*. Evaluation of a multi-faceted diabetes care program including community-based peer educators in Takeo Province, Cambodia, 2007–2013. *PLoS One* 2017;12:e0181582.
- 20 International Council of Ophthalmology. Situation analysis for managing diabetic retinopathy in Takeo, Cambodia, 2012. Available: <http://www.icoph.org/resources/385/Situation-Analysis-for-Managing-Diabetic-Retinopathy-in-Takeo-Cambodia.html>
- 21 HEALTH STRATEGIC PLAN 2016–2020. Phnom Penh: Ministry of health, 2016. Available: [http://hismohcambodia.org/public/fileupload/carousel/HSP3-\(2016-2020\).pdf](http://hismohcambodia.org/public/fileupload/carousel/HSP3-(2016-2020).pdf)
- 22 Hellowell M. Are public–private partnerships the future of healthcare delivery in sub-Saharan Africa? lessons from Lesotho. *BMJ Glob Health* 2019;4.
- 23 Finlayson B, Menthonnex S, Thomas F, *et al*. Assessment of Public–Private partnerships in Cambodia, constraints and opportunities, 2012. Available: <https://www.adb.org/sites/default/files/publication/29921/assessment-ppp-cambodia.pdf>