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Perceived barriers to utilization of maternal health services in rural Cambodia

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ABSTRACT

Objective: The aim of this study was to identify the underlying causes of Cambodian women's non-use of maternal health services provided by skilled birth attendants.
Method: A qualitative study of 66 reproductive-age women was conducted in Kampong Cham Province, Cambodia. Data were collected through 30 semi-structured interviews and 6 focus groups.
Results: We identified 5 barriers to the utilization of maternal health services: (i) financial barriers; (ii) physical barriers; (iii) cognitive barriers; (iv) organizational barriers; and (v) psychological and socio-cultural barriers.
Conclusions: The Cambodian Ministry of Health and its development partners should take these barriers into account when promoting the use of maternal health services. These barriers should be addressed proactively. A successful approach to increasing use of maternal health services should involve changes to both service programs and public education.

1. Introduction

The maternal mortality ratio in Cambodia was 472 per 100,000 live births as of 2005 [1], the third highest of all South Asian countries [2]. The major causes of maternal mortality in Cambodia, as elsewhere in the world [3], are abortion-related complications, obstructed labour, hemorrhage, eclampsia, sepsis, and infection [4]. Utilization of services provided by skilled birth attendants (SBAs), such as midwives and physicians, is generally considered an effective way to address these issues and reduce maternal mortality [5–8]. In Cambodia, 78% of deliveries are performed at home, and 56% of deliveries are performed with

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the assistance of untrained providers, such as traditional birth attendants (TBAs) [1]. In general, the assistance of TBAs does not substantially reduce maternal mortality and morbidity, regardless of whether the attendants are trained or untrained [9,10].

Two types of factors, i.e. factors related to the service-providers (SBAs) and factors related to the service-users (pregnant women), are likely to contribute to the low use of SBA services in Cambodia. The availability of SBA services is somewhat limited due to a serious shortage of healthcare personnel (service-providers) [11]. Cambodia is identified as one of the countries showing acute shortage of health professionals (e.g. physicians, midwives, and nurses) with a ratio of only one per 1000 people [12]. This ratio is much lower than 2.5 per 1000 people, the minimum requirement for ensuring at least 80% of births are served by SBAs [12]. There is still a shortage of healthcare personnel in Cambodia: during the Khmer Rouge Regime (April 1974 to January 1979), many educated people, including health professionals, either left Cambodia or were killed [13]. However, the current Cambodian government has addressed this need by prioritising the professional development of healthcare personnel [14,15], and the number of physicians and midwives increased by 10.3% from 1996 to 2005 [14,16]. Since the introduction of a national health coverage plan in 1996, the government has been constructing and rehabilitating governmental health facilities throughout the country with the aim of providing a minimum package of health services, including SBA services. Nevertheless, particularly in rural communities, women (service-users) often do not utilize the SBA services. In rural Cambodia, only 39% of women have a SBA present during delivery, while more urban women (70%) access SBAs delivery care services [1].

Various perceived barriers of women to use of health facilities for maternal health services have been identified in multiple low income settings. These are direct and indirect costs [1,17–20], poor geographic access (distance, poor road conditions, transport problems, etc.) [1,17,19], quality of care (poor facilities, lack of essential drugs, poor treatment by health professionals, etc.) [1,17,19,21], limited knowledge about services available [19], ill-mannered attitude of health professionals [19,22,23], women's physical condition (i.e. the concept of normal versus abnormal pregnancy) [17,22,24,25], self-efficacy from previous experience [24], socio-cultural and traditional norms [22,24–26], psychological security with relatives presenting during delivery [25]. In addition, a study found correlations of factors influencing women's use and non-use of maternal health services, across six developing countries—Bangladesh, Bolivia, Ghana, Indonesia, Malawi, and the Philippines: residence location (urban vs. rural), socio-economic status (rich vs. poor), maternal education (more vs. less), antenatal care (more vs. less), and birth order (less vs. more) [27].

However, in Southeast Asia including Cambodia, earlier studies have not clearly identified the reasons, or women's decision making process underlying this non-use. This study, therefore, aimed to identify the barriers to utilization of maternal health services, particularly of delivery care services provided by SBAs, by surveying reproductive-age women in rural Cambodia.

2. Methods

2.1. Study area

This study was conducted in September and October of 2006 in six purposively selected communities, two in each of three Ministry of Health operational districts in Kampong Cham Province, Cambodia. The operational districts were Kampong Cham—Kampong Siem, Memot, and Kroch Chhmar.

2.2. Qualitative data collection

We conducted semi-structured interviews (SSIs) and focus group discussions (FGDs) with reproductive-age women.

2.3. Selection of interviewees

Participants in each SSI and FGD were selected by purposive sampling of reproductive-age women aged 15–49 years residing in the six communities. We specifically included both women who had and who had not used the maternal health services available at governmental health facilities. Community leaders were informed of the study objectives and participant selection criteria, and were requested to select the participants in advance. Five women were selected for an SSI in each community (for a total of 30 women). Five to seven women were recruited to take part in each FGD (a total of 36 women).

2.4. Procedure and data analysis

We collected data from the participants regarding their experiences with maternal health services, their opinions of the services, and what they perceived as barriers to utilization of the services. The responses and discussions from the SSIs and FGDs were transcribed and typed into a word-processing program on a computer. Using the word-processing software, key phrases were coded and categorized.

3. Results

The SSIs and FGDs conducted with a total of 66 women helped us identify five barriers to the utilization of maternal health services: (i) financial barriers; (ii) physical barriers; (iii) cognitive barriers; (iv) organizational barriers; and (v) psychological and socio-cultural barriers.

3.1. Financial barriers

3.1.1. Lack of money

Lack of money was the most frequent cited barrier to utilization of SBAs' services. In the FGDs, some women claimed that they had decided not to receive the services because they could not afford it. One woman stated:

> When my baby got stuck in my belly, it was difficult for my TBA to help me. So, she tried to send me to the near-

est health center, but I decided not to go there because I didn't have cash with me

3.1.2. Inflexible payment plans

The governmental health facilities do not have flexible payment plans, accepting only lump-sum cash payment. Women often cited this reason for non-patronage of SBA. Most women, especially poor women, preferred to use a more flexible payment plan; such plans are often offered by non-SBAs (i.e. TBAs and other non-qualified health service providers). In an FGD, one woman commented:

> [I delivered at home] because both health centers and referral hospitals charge us when we leave there. If we deliver at home, we can pay them [TBAs and non-qualified health service providers] later.

In an SSI, another woman stated:

> I didn't need to give money to my TBA soon after delivery. When my baby became one month old, I held a small birthday party and I invited her to join the party and gave some cash to her

3.1.3. High opportunity costs

The temporal costs, borne by the family due to caring for a pregnant woman (for example, loss of income from family business, costs associated with transport to a health facility, etc.), were also considered to be a financial barrier. In an SSI, a woman made the following statement:

> When I had a third pregnancy, it was harvest season. So I wanted to help my husband, even during the pregnancy

3.2. Physical barriers

3.2.1. Poor geographic access to clinics

Distance to the health facility, poor road conditions, and inadequate transport were commonly cited reasons for not utilizing governmental maternal health services. This was a major obstacle for some women who opted to use TBAs for maternal health services. Two women commented in SSIs:

> I never visited the health center to check my pregnancy because it is so far and the road condition is too bad

> I see the TBA to check my pregnancy. The midwife lives in a different village, which is far from my village [approximately 5 km away]. Her [TBA's] house is close to mine.

3.2.2. Lack of ward space for resting after delivery

The health centres generally did not have attached inpatient wards. This was most likely why women were sometimes not allowed to rest within the health centre building after giving birth. Thus, some women were hesitant to deliver there. For instance, one woman stated in an FGD:

> After her delivery, my sister lay down on a cot put in the corridor [of the health center]. If there were more rooms to stay in at the health center, we would go there for delivery.

3.2.3. Women's physical condition

Some of the women cited their own physical condition as a reason not to use SBA services. First, some believed that they were healthy during their pregnancy and were likely to have a healthy birth; they viewed SBAs as needed only for abnormal or complicated deliveries. One woman stated in an SSI:

> I have never visited health professionals to check my pregnancy. This is because I haven't had any problem during past pregnancies since the first one

For normal pregnancies, the women were more likely to deliver at home with assistance from TBAs. For example, another woman commented in an FGD:

> I experienced only normal deliveries for my first two children with assistance from the same TBA. That's why I continued to ask the TBA to attend my subsequent deliveries

Second, some women could not deliver at a health facility due to preterm delivery. Another woman stated in an SSI:

> When I went to the health center to check my pregnancy, the midwife on duty told me that I would deliver on 13th June, but I delivered a day before [on 12th June]. I didn't go to the health center for delivery because I could not plan for it.

Third, despite their willingness to deliver at a medical facility, women sometimes could not reach the facility due to the short period between the onset of labour pains and delivery.

3.3. Cognitive barriers

3.3.1. Misconceptions about user fees

Women commonly thought the governmental health facility fees were much higher than they officially were. This informational gap made them hesitant to deliver at governmental health facilities because they thought the services would be too expensive. For example, one woman stated in an SSI:

> I wouldn't mind if the hospital charged only 20,000 riel for delivery [the official fee]. But, I have heard from people in different villages that the hospital charges us much more: 100,000–200,000 riel [$23–$46 US dollars at 4305.74 Riels/USD].

The average household expenditure per day in rural communities in Cambodia is about 2571 riel [28]; thus, 20,000 riel is greater than a quarter of the monthly household expenditure.

3.3.2. Beliefs about the quality of health services

It was clear that the women who participated in this study did not know what medical equipment was available at the health centres. Nevertheless, they tended to believe that the more medical equipment the centre had, the better the quality of the provided maternal health services. For example, one woman commented in an FGD:

> I don't visit the health center for antenatal care because the health center doesn't have enough medical equipment. When we have a problem, all they will probably do is refer us to the referral hospital. The health center cannot manage difficult cases because it does not have adequate medical equipment

3.3.3. Limited knowledge or misinformation about health professionals and services

Two women, one of whom participated in an SSI and one in an FGD, did not know that health professionals and maternal health services were available in their communities. One commented in the SSI:

> [I asked the TBA to attend my delivery] because I didn't know about the health center midwife at that time. If I had known about her presence, I would have visited her.

The other stated in the FGD:

> Before, I had not known that the health center midwife provided antenatal care services. I just came to know about it after some women in the village had met her seeking her services.

3.3.4. Obfuscation of the due date

Interestingly, the predicted delivery due dates that SBAs had determined during antenatal care sometimes receded from women's memory. When this happened, even women who had antenatal care provided by SBAs did not seek delivery care at the health facilities; instead, they relied on TBAs. For example, one woman stated in an FGD:

> I misestimated the number of days until my expected date of delivery by about one month. The midwife at the health center told me that my delivery would be in June. But I came to understand, for no particular reason, that my delivery due date was July. . .In the end, my delivery actually took place in June as the midwife had told me [and I asked a TBA to attend the delivery].

3.4. Organizational barriers

3.4.1. High service fees for private SBA services

When SBAs at health centres are invited to a client's home to attend a delivery, they often charged the client for private service rather than public service, even when the visit was during hours when the health centre was open. The private service fees were much higher than the standard rate at a governmental health facility. Two women expressed their dissatisfaction during an FGD:

> The health center midwife is already paid for her regular hours at the health center. Therefore, she should not charge us additionally [i.e. as a private midwife].

> If we continue to ask her to attend delivery at home, she will continue to charge us more, as if she were a private midwife

3.4.2. The perceived limited midwifery skills of SBAs

Some women perceived that the midwifery skills of SBAs at health centres were limited compared to those at referral hospitals or at private/NGO clinics. For this reason, they tended not to utilize maternal health services at health centres. For instance, a woman commented in an SSI:

> She [health center midwife] is only a little bit skilled. If I had severe labour pains, I guess she would refer me to a hospital.

Not surprisingly, women want to see competent and experienced SBAs, particularly when they have serious maternal health problems [29,30]. The women who participated in the FGDs did not want to ask an SBA who had just completed a midwifery course and had no experience as a practitioner to attend their deliveries. For instance, one of them stated:

> In this village, nobody asks the health center midwife [to attend a birth]. I have never seen the midwife visiting any pregnant women to attend her delivery.

3.4.3. Impolite behaviour of health professionals

Some women hesitated or avoided accessing maternal health services due to impolite or inappropriate behaviour and attitudes of health professionals at governmental health facilities. For example, three women commented in the SSIs:

> If the midwife and other health professionals were kind and paid careful attention to me, I would go to the health center for the purpose of delivery. Otherwise, I would call a TBA and deliver at home. . .When my daughter was sick, I used to go to the health center. But the doctor was neither friendly nor polite. If I don't pay money to the health centre staff, they tend to come late to see my daughter. But if I pay money to them, they come to see us earlier. Actually, I have given them money in order to have them see us earlier

> For my sister's delivery. . .we (my sister and I) arrived at the [governmental] hospital around noon. The midwife was taking a nap. So, when I asked her to help us, she got very angry, and blamed us for coming to the hospital and starting labour pains during the lunch break.

> The midwife at the health center hesitates to come when poor people call her, and she doesn't hurry to them. . .If rich people call her, she normally hurries to them

3.4.4. Less care after delivery

One woman who was interviewed stated the following as a reason for not wanting to deliver at a health centre:

> I do not want to deliver at the health center. When I went there to ask for medicine, I saw one woman who had just completed her delivery. She was left alone without health staff attendance. The midwife helped only for delivery: after the delivery, she went back home and left the patient alone

3.4.5. Absence of health staff

The absence of SBAs at governmental health facilities was also a barrier to using the government clinics: Outreach activities and their own private practices substantially decreased the presence of SBAs at health facilities during

business hours. For example, one woman stated in an FGD:

> I don't want to deliver at the health center because health staff are not available at the health center for most of the time. They tend to spend more time doing private practices at village people's houses

3.5. Psychological and socio-cultural barriers

3.5.1. Experiential judgment of the elderly of the community

The women participating in the SSIs and FGDs who lived in rural communities with limited access to health services still had little alternative but to rely on advice from the elderly. For instance, one woman stated in the SSI:

> [I didn't go to the health center for delivery] because the elderly in the village told me that my mother had given birth to me at home easily, so they thought that I should do the same thing my mother did.

Another woman commented in the FGD:

> My parents always say that if my physical condition during pregnancy is normal, it is enough for me to see a TBA for abdominal massage

3.5.2. Traditional beliefs and practices

During the antenatal and postnatal periods, most women take traditional medicine and hold traditional ceremonies; these could be barriers to utilizing maternal health services provided by SBAs. Some of these traditions can be harmful to the women's health. One woman commented in an FGD:

> The elderly in our village advise us to take traditional herbal medicines during pregnancy so that we will give a safe delivery

In SSIs, two women stated:

> [After delivery] I took traditional medicines mixed with wine continuously for three months.

> [I delivered at home] because I could be roasted at home.

"Roasting" is the most popular and traditional postnatal activity tradition in rural communities of Cambodia. A woman spends a minimum of three days, and up to a month, lying beside a fire or on a mat bed over coals where she is "roasted" to revive her strength and replace the heat that is perceived to be lost during childbirth [31].

Particularly in rural communities, delivering at home is perceived as a common and natural practice. One woman who participated in an SSI did not consider delivery at a health facility as an alternative. She stated the following:

> Because delivery at home is habit and common practice of pregnant women in this village, I didn't visit the health centre to deliver my baby

3.5.3. Trust and comfort levels with TBAs

Although TBAs are not necessarily highly skilled in midwifery, they are kind and friendly to their clients, and women prefer them as birth attendants. Four women stated in SSIs:

> The TBA attended the delivery...because it was comfortable for me to deliver with her attendance

> Although the TBA doesn't have medical equipment, she has her cordial willingness to help us

> Many village women believe that they can deliver easily once the TBA touches belly

> During my first pregnancy, I did not believe in the midwife's skills. I have heard that midwives of the governmental health facility tell women to walk, lie down and sit all the time until delivery...The TBA did not ask me to do so. She just let me lie down until I finished my delivery.

3.5.4. Discomfort in delivery at governmental health facilities

Many women feel the most comfortable receiving support from their family members after delivery, so they tend to prefer their home to health facilities as a delivery location. In an SSI, one woman commented:

> Delivery at home is more comfortable...the health center staff go back home after duty hours every day. Thus, if I decide to delivery at a health facility, I have to stay there alone. If I deliver at home, my mother and neighbors will come to see and take care of me

3.5.5. Hesitance to access SBAs due to no prior contact with them

The statements of some women indicated that contact, or lack of contact, with SBAs during pregnancy was connected to their selection of birth attendant and delivery location. Two women stated in SSIs:

> I had never visited the health centre in my village, so I was shy about going to the health centre for delivery

> If I feel pains at night and ask the midwife to come to attend my delivery, she would not come because we do not know each other well

3.5.6. Anxiety of delivering on the way to a health facility

Despite her willingness to deliver at a health facility, one woman decided to deliver at home with the assistance of a TBA due to her fear of delivering on the road en route to the health facility. The woman stated in an SSI:

> I called a TBA for delivery because I was afraid that I might deliver on the way to the health center

4. Discussion

This study used SSIs and FGDs to identify five types of barriers to the utilization of maternal health services in Cambodia: (i) financial barriers; (ii) physical barriers; (iii) cognitive barriers; (iv) organizational barriers; and (v) psychological and socio-cultural barriers. Fig. 1 summarizes the findings of this study by depicting the perceived barriers, and the relationships of the perceived barriers, that may contribute to lower utilization of governmental mater-

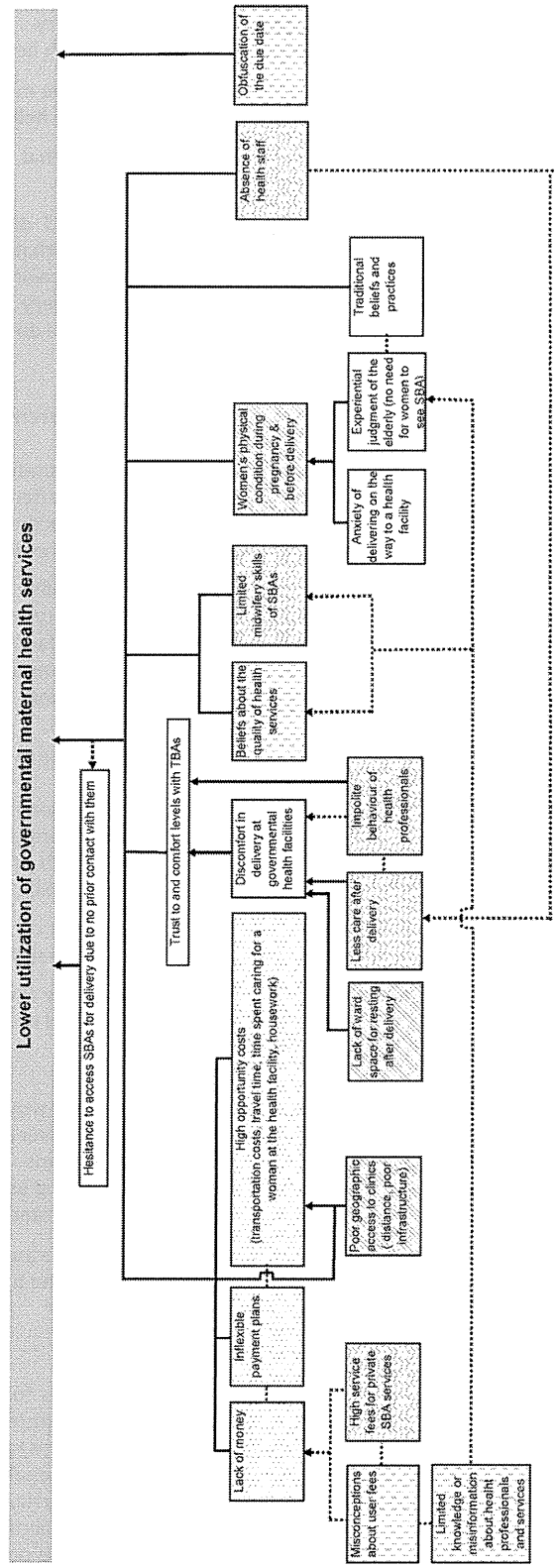

Fig. 1. Possible decision making process of reproductive age women for non-use of governmental maternal health services.

nal health services. This figure could also indicate women's decision making process for lower use of the services.

Some of these perceived barriers are interrelated. For example, "*Lack of money*" is related to "*Misconceptions about user fees*" and "*High service fees for private SBA services.*" Many women were not clear on the costs of normal versus complicated deliveries, and of deliveries at a governmental health facility versus at home births assisted by a governmental SBA (i.e. "*limited knowledge or misconception about health services*"). Adding to this confusion about the fees, and further complicating the situation, health professionals sometimes demand unofficial payment from patients to compensate for the low salary they receive from the government [32]. In order to minimize confusion, the correct official user-fees for each type of health services should be presented in a transparent manner to the public.

Although a flexible payment plan is attractive to poorer families, it is not realistic to expect governmental health facilities to offer flexible payment plans, although this would remove a major financial barrier to accessing SBA services [33]. This is because a flexible payment mode complicates financial reporting, reduces financial accountability, and ultimately undermines the financial stability of the health facilities. As reported earlier by Noirhomme et al. [34], the most feasible way to reduce the payment burden in developing countries is to fully or partially exempt the extremely poor from payment.

"*High opportunity costs*" are likely to be associated with "*Poor geographic access.*" Women in rural communities of Cambodia were twice as likely to have poor geographic access to health services as those in urban communities [1]. "*High opportunity costs*" are also related to the social structure in rural areas of Cambodia, where strong mutual relationships and kinship beyond the nuclear family are not maintained [35]. For example, people neither ask for nor expect help from neighbours when they have to be absent from home to take a sick child to a hospital. This individualism, along with a lack of mutual trust, is largely due to the cumulative psychological trauma inflicted by the betrayal system instituted by the Khmer Rouge Regime from April 1974 to January 1979.

Currently, many health centres do not have attached in-patients wards. In order for women to rest comfortably after giving birth, additional space must be arranged within facility buildings.

The results of our study revealed that when a "*Woman's physical condition*" is normal, she tends not to seek SBA services, frequently by following "*Experiential judgment of the elderly.*" This study also indicates that "*Experimental judgment of the elderly*" is associated with "*Traditional beliefs and practices*". Although the most important determinant of high quality (traditional) delivery services is adherence to the traditional protocol [26], some traditional practices are harmful or questionable from a medical standpoint [36]. Health education and promotions that target the community, particularly the elderly, are needed to gradually reduce harmful traditional practices.

This study revealed that lower utilization of governmental maternal health services was due in part to the perception that SBAs provided lower quality maternal health services (i.e. "*Beliefs about the quality of health services*" and "*The perceived limited midwifery skills of SBAs*"). There is a critical shortage of healthcare workers in Cambodia [11], and it is clear that there is a dual need to increase the number of health professionals and to allocate them rationally. Moreover, the availability of quality staff and continuous improvement of their professional skills are essential if we want women to seek government-provided maternal health services. Clients tend to perceive the presence of medical equipment and provision of medical products such as echography and prescription of multiple drugs as an indicator of better health service. Therefore, women need to be educated about which medical facilities provide which services.

Some women in Cambodia do not know what services are provided by local health centres ("*Limited knowledge or misinformation about health professionals and services*"). In agreement with this, a significantly greater proportion of pregnant women in non-MPA[5] health centre catchment areas sought advice from a TBA than did women living in MPA health centre catchment areas [37]. This barrier can be related to others, such as "*Misconceptions about user fees,*" "*Beliefs about the quality of health services,*" "*The perceived limited midwifery skills of SBAs*" and "*Experiential judgment of the elderly.*"

"Impolite behaviour of heath professionals" can be seen as an underlying cause of "Trust and comfort levels with TBAs" and "Discomfort in delivery at governmental health facilities." It is also likely to be associated with "Less care after delivery." "Less care after delivery" might also be connected to "Absence of health staff," because about half of the women surveyed expressed their concern about no health providers being available at governmental health facilities [1]. Needless to say, health professionals do not always behave impolitely, although some of them may be kinder when they work as private health providers in non-governmental health facilities. These professionals perform emotionally draining work but receive low pay; this may be reflected in their attitude and daily behaviour. While they should be trained to communicate with clients in a respectful way, it is also true that their working environment needs improvement in terms of, for example, better drug and equipment availability, higher salary, and greater social benefits.

Probably due to the above-mentioned barriers, women tend not to access SBAs for antenatal care and are subsequently unlikely to use SBA delivery services ("*Hesitance to access SBAs for delivery due to no prior contact with them*"). Yanagisawa et al. [30] reported that primiparas are a crucial as a target population for SBA attendance promotion, because once women have had non-SBAs, it is five to seven times more difficult to convince them to use a skilled attendant for later deliveries. Although frequent antenatal care attendance would have an impact on selecting SBAs for

[5] The MPA (Minimum Package of Activities) is composed of basic preventive and curative services such as immunization, family planning, antenatal care, provision of micronutrients and other nutritional support, and simple curative care for diarrhea, acute respiratory tract infections, and tuberculosis.

delivery [6,38], note that counseling on facility delivery during antenatal care is important [39].

This study was subject to some limitations. The advantages of conducting an SSI are that an interviewee can speak freely and candidly, and the interviewer is able to probe topics in certain depth without interruption [40]. The disadvantages are that the answers are subjective and qualitative, making data standardization and comparison difficult.

An FGD has some quality controls and reliability checks in terms of the information provided, since the participants tend to balance their views with those of others [41]. Patton [42] pointed out the limitations of FGDs, namely that only a limited number of questions can be covered, and it is difficult to take notes during the discussion.

Both the SSI and FGD, compared to ethnographic works such as life histories and case studies, have a limitation in terms of fineness or deepness of data obtained.

As participants selection for the SSIs and FGDs were in the hands of community leaders, selection bias might occur in the procedure.

In conclusion, this study identified several barriers to utilization of maternal health services in Cambodia. Most of the barriers identified in this study have been already found in other regions of the world. This study conducted in Southeast Asia as well as recent studies [43–45] also support the earlier studies. Whereas, this study provides another detailed case illustrating them. In addition, this study explored some context-specific issues of traditional beliefs and practices such as taking traditional herbal medicines and roasting. We could also analyze complex possible relations among the barriers identified, and provide some intervention options. To overcome these barriers identified, we recommend a multifaceted and integrated approach to increase the use of SBAs and thus improve maternal mortality. The approach must not be superficial, and it should involve both the providers and the women (i.e. the service-provider and the service-user). Because health policy interventions have focused much on reducing service-provider side barriers (e.g. improving the quality of health professional skills, availability of supplies, and environment of health facilities), yet they do not address many of the barriers to accessing the services faced by women in low-income countries [46]. Local challenges to many of the common barriers, and local meanings of several issues, could perhaps be explored further to improve things. We realize that a quantitative study might provide a more detailed picture of the relative contribution of each barrier to non-use of SBAs and thus help prioritise potential solutions. We hope that the present study will serve as a starting-point for such studies.

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Postpartum Plasma CD4 Change in HIV-Positive Women: Implications for Timing of HAART Initiation

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Abstract

CD4 counts increase during the postpartum period and may not correctly identify HAART-eligible HIV-positive women. HAART eligibility when defined by two CD4 cutoffs (<200 and <350 cells/μl) measured at two time points (within 96 h of delivery and 6 weeks) in postpartum HIV-positive women was compared. Among HIV-positive women who had CD4 at delivery and 6 weeks ($n = 423$), time to Stage 3 or 4 opportunistic infection or death was compared using Cox regression between three groups of women: (1) CD4 <200 cells/μl at delivery and 6 weeks, (2) CD4 <200 cells/μl at delivery but ≥200 cells/μl at 6 weeks, and (3) CD4 ≥200 cells/μl at delivery and at 6 weeks. The analysis was repeated using the CD4 <350 cells/μl cut-off. CD4 counts increased by a median (IQR) of 70 (1–178) cells/μl between delivery and 6 weeks and decreased thereafter to approximately delivery levels at 12 months. Only 60% and 61% who had CD4 <200 cells/μl and CD4 <350 cells/μl, respectively, at delivery also had those levels at 6 weeks. Among those with CD4 <350 cells/μl at both delivery and 6 weeks, the risk of death or Stage 3 or 4 disease was 5.27 (95% CI 1.85–14.96) times higher than those with CD4 <350 at delivery but ≥350 cells/μl at 6 weeks. The use of CD4 counts immediately postpartum to define HAART eligibility may lead to substantial misclassification.

Introduction

In the course of HIV infection, plasma CD4 cell counts decrease on average 75 cells/μl per year.[1] Conversely, CD4 cell counts rise in women following pregnancy, due to resolution of physiologic hemodilution in both HIV-uninfected and HIV-infected women.[2–4] The WHO guidelines currently recommend CD4 <200 cells/μl as an absolute indication of highly active antiretroviral therapy (HAART) initiation and CD4 <350 cells/μl as a benchmark to consider treatment.[5,6]

A recent publication reported that using CD4 counts at 32 weeks of gestation as HAART eligibility criteria leads to substantial misclassification of HAART eligibility when compared to CD4 values at 1 month postpartum.[7] Using WHO clinical staging and CD4 counts, 28.3% of women in this study were HAART eligible according to their baseline CD4 values whereas only 17.2% were eligible according to their postpartum CD4 values. The authors pointed out that CD4 percentage may be a more accurate indicator of immune status in pregnant and postpartum women than absolute CD4 since the former is less affected by hemodynamic changes associated with pregnancy and postpartum. Misclassification of HAART eligibility or premature initiation of HAART may lead to increased viral resistance, waste of resources, non-compliance, and unnecessary adverse events.[8–12] In this article, we describe the change in absolute CD4 cell count postpartum up to 12 months and the potential misclassification of HAART eligibility if using CD4 cell counts measured immediately postpartum.

Materials and Methods

ZVITAMBO trial

Details of the ZVITAMBO trial have been previously published.[13–15] Briefly, 14,110 mother–infant pairs were recruited within 96 h of delivery in greater Harare, Zimbabwe between November 1997 and January 2000. Mothers were eligible if they did not have a life threatening condition and had planned to stay in Harare after enrollment. Written informed consent was obtained. Baseline characteristics were collected from hospital records and a questionnaire. Follow-up was conducted at 6 weeks and 3 months and 3-monthly intervals through 12–24 months. At delivery, women were tested for HIV by an algorithm incorporating two parallel

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ELISAs and Western blot. CD4 cells were counted by FACScount (Becton Dickinson). Among a randomly selected subgroup of approximately 10% of HIV-positive women, CD4 cells were also counted at 6 weeks and at 3, 6, 9, and 12 months. Weight was measured at each follow-up visit but not at delivery. At each visit, a 7-day morbidity history was elicited that included oral thrush and chronic diarrhea, and mothers were asked if they had been hospitalized or visited a clinic for treatment of an illness since their previous visit.

The causes and dates of these health care visits were determined from medical records, if available, or by maternal history. Data were available to identify the following Stage 3 opportunistic infections: chronic diarrhea, recurrent or persistent oral candidiasis (presence of at least two oral thrush episodes during follow-up with a ≥14 days interval between the two episodes), pulmonary tuberculosis (TB), and severe bacterial infections (e.g., pneumonia, meningitis, and sepsis). All severe bacterial infections were diagnosed at a clinic or hospital. Data were available to identify the following Stage 4 opportunistic infections: HIV wasting syndrome (simultaneous presence of ≥10% weight loss relative to any previous weight measurement during study and chronic diarrhea as defined in Stage 3), recurrent severe pneumonia (≥2 episodes of pneumonia during follow-up with ≥14 days interval between the two episodes), esophageal candidiasis, extrapulmonary TB, and Kaposi's sarcoma (all diagnosed during a clinic visit or hospitalization). Antiretroviral therapy (ART) was not available during the trial either as prophylaxis or treatment.

Statistical analysis

Statistical analysis was conducted using Stata Version 9.2 (StataCorp LP, Texas). Overall, 14,110 women were recruited and 4495 women were HIV positive at delivery. CD4 was counted at follow-up in a random subsample of approximately 10% of the HIV-positive women. To describe accurately the postpartum trajectory of CD4 counts in the first year, we restricted analyses that involved delivery, 6 week, and 12 month data to those with CD4 data at all those time points. Wilcoxon signed rank tests were used to test change in CD4 distribution between delivery and 6 weeks or 12 months and between 6 weeks and 12 months. McNemar's test was used to test pairwise changes in the proportion of those with CD4 <200 or <350 cells/μl at delivery, 6 weeks, and 12 months.

We also calculated the sensitivity, specificity, positive and negative predictive value, and 95% confidence intervals using information on 423 women who had CD4 measured at both delivery and 6 weeks. We considered CD4 counts at 6 weeks to be the gold standard indicator of immune status at delivery and used CD4 cut-off points of 150, 175, and 200 cells/μl and 300, 325, and 350 cells/μl at delivery to assess its correlation with, and sensitivity, specificity, and predictive values in identifying CD4 counts with cut-off points of 200 and 350 cells/μl at 6 weeks, respectively, among 423 women who had CD4 data available at both time points. Finally, Kaplan–Meier methods were also used to estimate cumulative risk of Stage 3 or 4 disease or death by CD4 count at delivery and 6 weeks.

The 423 women who had CD4 counts at delivery and 6 weeks were divided into three groups: (1) CD4 <200 cells/μl at delivery and 6 weeks, (2) CD4 <200 cells/μl at delivery and CD4 ≥200 cells/μl at 6 weeks, and (3) CD4 ≥200 cells/μl at both delivery and 6 weeks. The censoring date was the last date of follow-up, the first date in which Stage 3 or 4 disease was identified, or the date of death, whichever occurred earlier. We assessed the time to Stage 3 or 4 disease or death between 6 weeks and 24 months using the Cox proportional hazards model and present the 95% confidence intervals. The analysis was repeated by using the CD4 <350 cells/μl cut-off point.

Ethical approval

Ethical approval was granted from the Medical Research Council of Zimbabwe, Medicines Control Authority of Zimbabwe, the Committee on Human Research of the Johns Hopkins University Bloomberg School of Public Health, and the Ethics Committee of the Research Institute of the McGill University Health Center.

Results

A total of 226 women had complete CD4 count information at delivery, 6 weeks, and 12 months. The median (IQR) number of days between delivery and blood sampling at 6 weeks and 12 months was 43 (42–46) days and at 12 months was 365 (365–368). As illustrated in Fig. 1, the median CD4 cell count increased between delivery and 6 weeks but gradually decreased by about the same magnitude between 6 weeks and 12 months such that the counts at delivery and 12 months did not significantly differ. Among the 27 women who had CD4 <200 cells/μl at delivery, 12 (44.4%) had CD4 ≥200 cells/μl at 6 weeks and among these 12 women, 7 (58.3%) still had CD4 ≥200 cells/μl at 12 months. Among the 78 women who had CD4 <350 cells/μl at delivery, 34 (43.6%) had CD4 ≥350 cells/μl at 6 weeks and among these 34 women, 21 (61.8%) still had CD4 ≥350 cells/μl at 12 months (Table 1).

Between delivery and 6 weeks postpartum, CD4 cell count increased in 75.5% (170/226) of the women (Fig. 2). Between delivery and 12 months partum, CD4 cell count increased in 46% (104/226) and decreased in 54% (122/226) of the women. In contrast, 179 (79.2%) women had lower CD4 counts at 12 months than at 6 weeks. At 6 weeks, a smaller proportion of women had CD4 values of <200 cells/μl (6.6% vs. 12.0%; $p = 0.0005$) or <350 cells/μl (22.1% vs. 34.5%; $p = 0.0000$) compared to delivery. However, at 12 months, the proportions of women with CD4 <200 cells/μl and CD4 <350 cells/μl were not different compared to delivery (12.0% vs. 12.0%; $p = 1.0000$ and 35.0 vs. 34.5%; $p = 1.0000$), respectively. Based on the finding that CD4 counts on average increase between delivery and 6 weeks, we investigated the utility of using lower CD4 cut-off points at delivery than the conventional cut-off points of 200 and 350 cells/μl to identify HAART eligible women. Among those who had CD4 counts <150 cells/μl at delivery, 83% of the women also had CD4 counts <200 cells/μl at 6 weeks but only 60% of the women who had CD4 <200 cells/μl at delivery also had CD4 <200 cells/μl at 6 weeks (Table 2, see PPV values). However, CD4 <150 cells/μl at delivery identified only 79% of women who had CD4 <200 cells/μl at 6 weeks whereas CD4 <200 cells/μl at delivery correctly identified 91% (Table 2, see Sensitivity values). The positive predictive values of all delivery cut-off points in identifying women with CD4 <350 cells/μl at 6 weeks were low (61–68%).

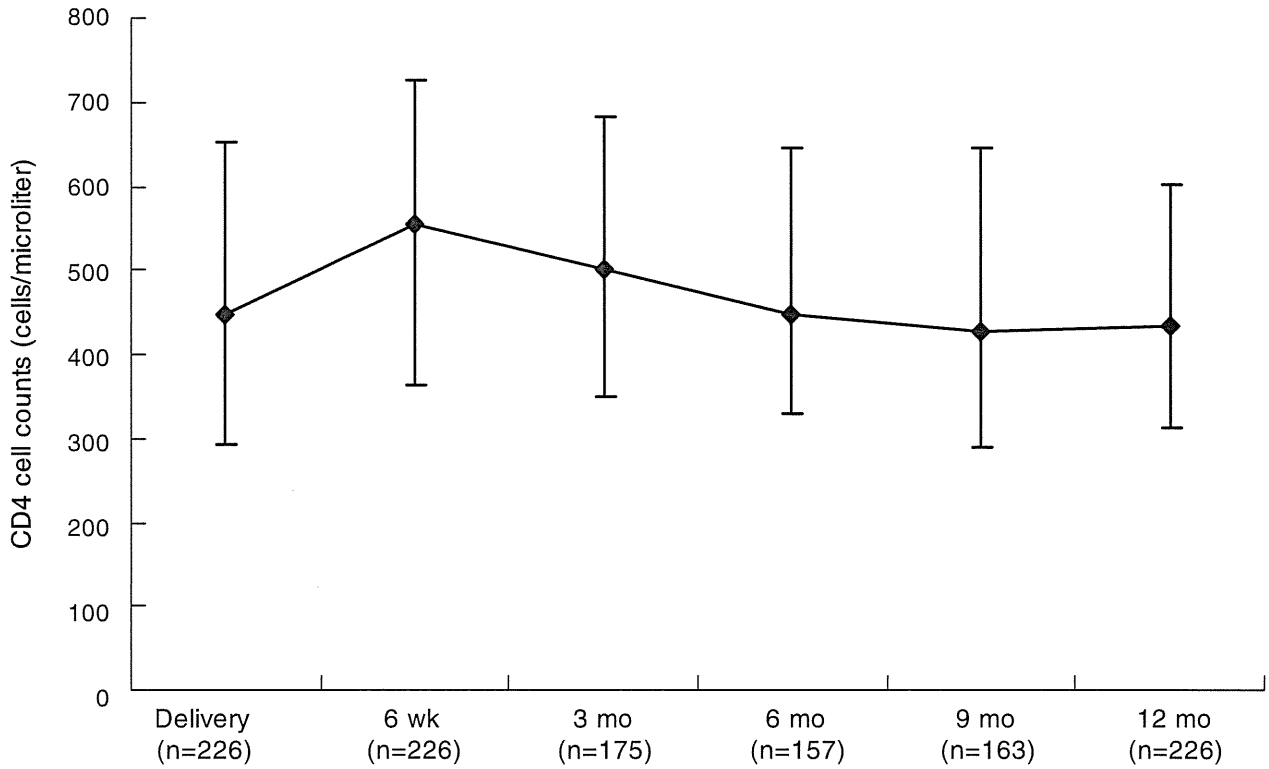

FIG. 1. Median and interquartile ranges of CD4 cell counts at delivery, 6 weeks, and 3, 6, 9, and 12 months postpartum. Only those who had information on CD4 counts at delivery, 6 weeks, and 12 months are included.

As shown in Fig. 3, women with CD4 counts that were <200 cells/μl at delivery and remained so at 6 weeks had the highest risk of death or Stage 3 or 4 opportunistic infection (HR 5.57; 95% CI 3.11–9.98; $p = 0.000$) compared to those who had CD4 ≥200 cells/μl at both time points. Compared to women who started with CD4 counts <200 at delivery and then had CD4 counts ≥200 cells/μl at 6 weeks, the risk of death or Stage 3 or 4 disease in women with persistently low CD4 counts at both delivery and 6 weeks was higher but not statistically significant (HR 2.84; 95% CI 0.96–8.45; $p = 0.060$). Having CD4 counts <350 cells/μl at both time points was also associated with a significantly higher risk (HR 5.27; 95% CI 1.85–14.96; $p = 0.002$) compared to those with CD4 <350 cells/μl at delivery and CD4 ≥350 cells/μl at 6 weeks.

Discussion

We have demonstrated that the majority of HIV-infected women in this cohort had higher CD4 counts at 6 weeks postpartum than they did within 4 days of delivery. Forty percent (26/65) of women with CD4 counts <200 cells/μl shortly after delivery had counts of >200 cells/μl at 6 weeks postpartum indicating that using CD4 count immediately postpartum as HAART eligibility criteria could lead to substantial misclassification of HAART eligibility. The magnitude of CD4 increase observed between delivery and postpartum was similar to other studies conducted in Africa.[2–4,7] In our study, the proportion with CD4 counts <200 and <350 cells/μl at delivery was 15.4% and 39.2%, respectively, and this decreased to 10.2% and 26.7%, respectively, by 6 weeks.

TABLE 1. POSTPARTUM CD4 CHANGE IN HIV-POSITIVE WOMEN[a]

N = 226 (total)	*Delivery*	*6 weeks*	*12 months*
Median (IQR[b]) (cells/μl)	448 (293–651)	553 (362–727)	432 (312–602)
Median difference from delivery (IQR) (cells/μl)		70 (1–178)[c]	−14 (−125–77)
Median difference from 6 weeks (IQR) (cells/μl)			−87 [−187–(−14)][c]

[a]The 226 women who had CD4 count available at delivery, 6 weeks, and 12 months are included.
[b]IQR, interquartile range.
[c]Significantly different from 0 by sign rank test ($p < 0.05$).

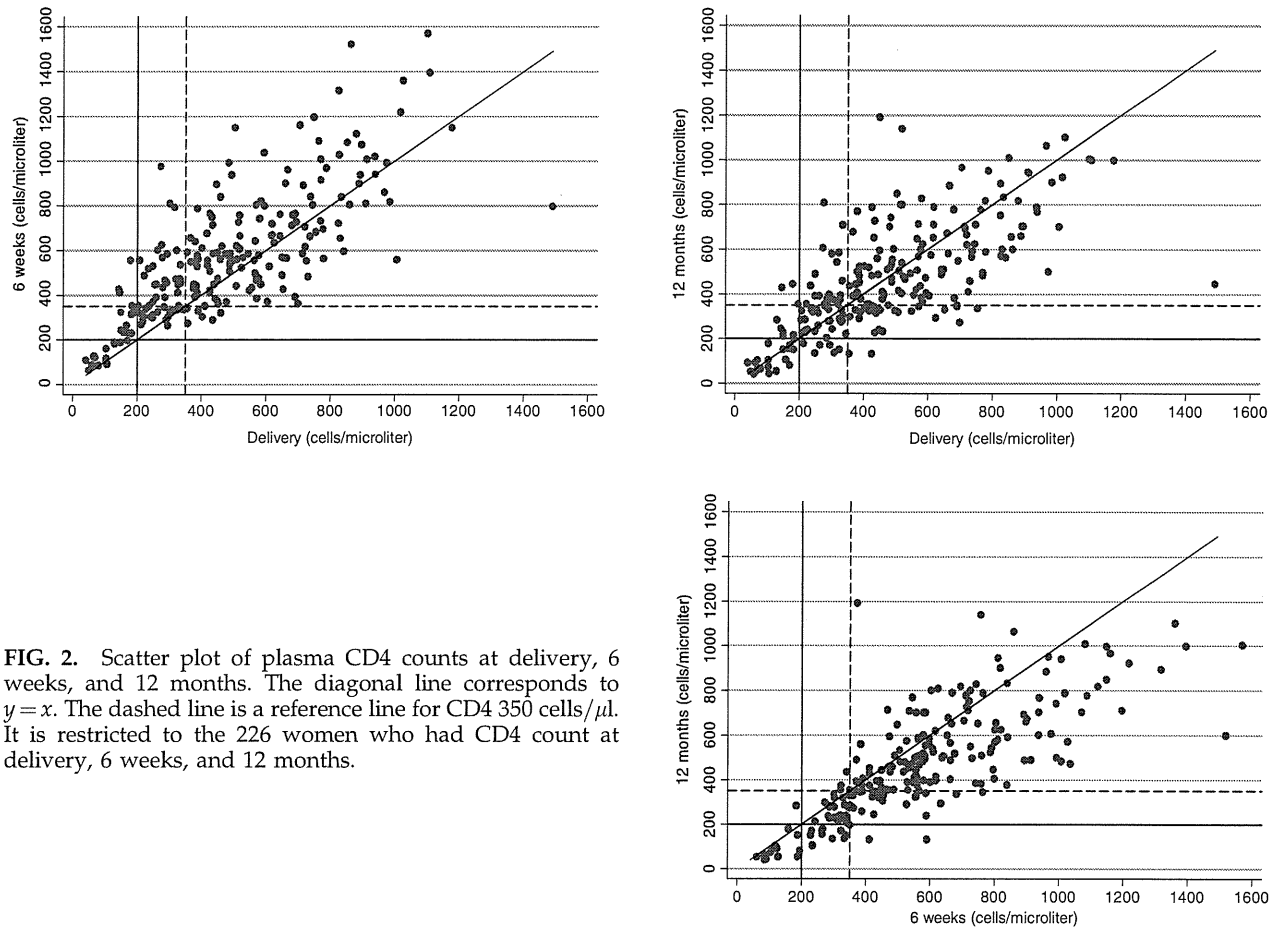

FIG. 2. Scatter plot of plasma CD4 counts at delivery, 6 weeks, and 12 months. The diagonal line corresponds to $y = x$. The dashed line is a reference line for CD4 350 cells/μl. It is restricted to the 226 women who had CD4 count at delivery, 6 weeks, and 12 months.

A study conducted in Ivory Coast with similar sample size also found similar results where 17.8% and 48.3% of the women had CD4 <200 and <350 cells/μl at 32 weeks gestation but at 1 month postpartum the proportion decreased to 9.5% and 28.9%, respectively.[7] Our study showed that CD4 200 and 350 cells/μl cut-off points at delivery correctly identified only 60% (95% CI 47–72) and 61% (95% CI 54–69) of women who had CD4 counts less than the same cut-off at 6 weeks. Of note, our study provides additional information regarding the association between CD4 counts obtained early during the postpartum period and risk of progression of HIV. We demonstrated that those who were HAART eligible based on CD4 counts at delivery but no longer so based on values at 6 weeks had a lower risk of Stage 3 or 4 opportunistic infections or death compared to those who were persistently HAART eligible at both time points.

The initiation of HAART is based on clinical, immunologic, and virologic indications, which in turn are associated with risk of progression of HIV. The consequences of initiation of HAART in those who are not in need of it for their health include potential unnecessary adverse events and depletion of scarce resources in settings with limited treatment options.[10,11,16] In our study, the proportion of women who were HAART eligible by the CD4 200 and 350 cells/μl cut-off points was almost identical at delivery and 12 months, meaning that values at delivery are a reflection of CD4 counts after 1 year. This finding was not surprising since it is known that CD4 counts decrease on average 75 cells/μl per year[1] and the median increase in CD4 counts between delivery and 6 weeks that we observed was 70 cells/μl. Also, more than half of the women who were HAART eligible at delivery but no longer so at 6 weeks were not HAART eligible even by 12 months.

The following may be proposed as possible solutions to correctly identify women during the postpartum period who would be in need of long-term HAART. First, although predictive values are known to be influenced by prevalence, we investigated the possibility that use of lower CD4 values than the conventional CD4 cut-off points for HAART eligibility at delivery might lead to less misclassification or higher positive predictive values. Compared to the conventional cut-off point of CD4 200 cells/μl, use of 175 cells/μl increased the positive predictive value from 60% to 72% while maintaining the same sensitivity of 91%. However, compared to the 350 CD4 cell/μl cut-off point, the positive predictive value increased only from 61% to 68% by using a 300 CD4 cell/μl cut-off point at the expense of lowering the sensitivity from 90% to 78%. Because this low level of sensitivity is not acceptable, we could not identify any cut-off point that might be of any benefit for the CD4 350 cells/μl cut-off point. Since women generally return to the clinic at 6 weeks for a postnatal health care visit for themselves and a vaccination for their infant, this would be a convenient time to check their CD4 count and then make

TABLE 2. NUMBER AND PERCENTAGE OF WOMEN BY CD4 CUTOFFS 200 AND 350 CELLS/μL AND TIME POSTPARTUM[a]

CD4 at delivery (cells/μl)	*CD4 at 6 weeks (n) (cells/μl)*		*Sensitivity (95% CI)*	*Specificity (95% CI)*	*PPV[b] (95% CI)*	*NPV[b] (95% CI)*
	<200	≥200				
<200	39	26	91 (78–97)	93 (90–95)	60 (47–72)	99 (97–100)
≥200	4	354				
<175	39	15	91 (78–97)	96 (94–98)	72 (58–84)	99 (97–100)
≥175	4	365				
<150	34	7	79 (64–90)	98 (96–99)	83 (68–93)	98 (96–99)
≥150	9	373				
	<350	≥350				
<350	102	64	90 (83–95)	79 (74–84)	61 (54–69)	96 (92–98)
≥350	11	246				
<325	97	53	86 (78–92)	83 (78–87)	65 (56–72)	94 (91–97)
≥325	16	257				
<300	88	41	78 (69–85)	87 (82–90)	68 (59–76)	91 (88–94)
≥300	25	269				

[a]423 women who had CD4 cell counts available at delivery and 6 weeks are included.
[b]PPV, positive predictive value; NPV, negative predictive value.

a treatment decision. Finally, it has been reported that CD4 percentage rather than absolute CD4 value is a better indicator of immune status as it remains stable even in the presence of hemodilution.[2,7] CD4 percentage is used to decide HAART eligibility in children[17] and further studies on the utility of this indicator in pregnant and postpartum women in deciding HAART eligibility are warranted.

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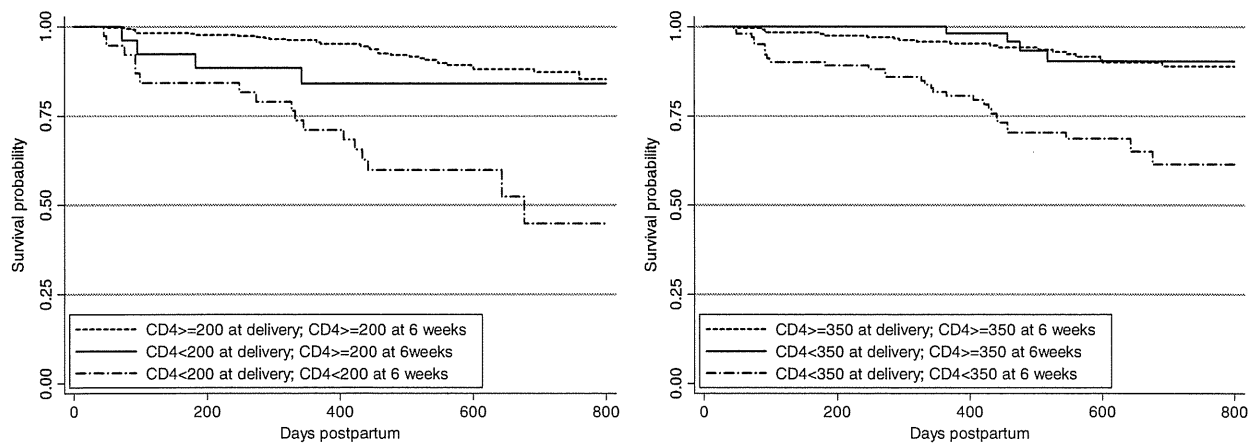

CD4 at delivery (cells/μ)	CD4 at 6 weeks (cells/μl)	Median (IQR) CD4 at delivery (cells/μl)	Median (IQR) CD4 at 6 weeks (cells/μl)	n	No. of OI[§]	No. of death	HR	95%CI	p value
≥200	≥200	477 (331-644)	558 (422-731)	354	30	4	1.00		
<200	≥200	168 (149-185)	275 (236-352)	26	4	0	1.96	(0.69-5.53)	0.203
<200	<200	104 (70-130)	118 (104-160)	39	15	2	5.57	(3.11-9.98)	<0.001
≥350	≥350	567 (459-721)	615 (524-812)	246	18	2	1.00		
<350	≥350	281 (243-317)	453 (400-568)	64	3	1	0.84	(0.29-2.45)	0.744
<350	<350	177 (110-251)	235 (129-299)	102	27	3	4.40	(2.50-7.79)	<0.001

FIG. 3. Kaplan–Meier survival curves of time to first Stage 3 or 4 opportunistic infection or death after 42 days postpartum by CD4 count at delivery and at 6 weeks. The 423 women who had CD4 count available at delivery and 6 weeks are included. [§]Opportunistic infections. Refer to the text for definitions.

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Author Disclosure Statement

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Survey of non-prescribed use of antibiotics for children in an urban community in Mongolia

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Objective To estimate the prevalence and identify the determinants of non-prescription use of antibiotics for children in Mongolia.
Methods A community-based cross-sectional survey was undertaken in 10 subdistricts in Ulaanbaatar, Mongolia's capital. We used a structured questionnaire to collect data from a random sample of 540 households with at least one child aged <5 years. Logistic regression was used to identify factors associated with antibiotic misuse.
Findings Of 503 participating caregivers, 71% were mothers; 42.3% (95% confidence interval, CI: 37.8–46.9) of caregivers had used non-prescribed antibiotics to treat symptoms in their child during the previous 6 months. Symptoms commonly treated were cough (84%), fever (66%), nasal discharge (65%) and sore throat (60%). Amoxicillin was the most commonly used antibiotic (58%). Pharmacies were the main source (86%) of non-prescribed antibiotics. Non-prescribed use by mothers was significantly associated with keeping antibiotics at home (odds ratio, OR: 1.7; 95% CI: 1.04–2.79), caregiver self-medication (OR: 6.3; 95% CI: 3.8–10.5) and older child's age (OR: 1.02; 95% CI: 1.01–1.04). Caregivers with a better knowledge of antibiotics were less likely to give children non-prescribed antibiotics (OR: 0.7; 95% CI: 0.6–0.8).
Conclusion The prevalence of non-prescribed antibiotic use for young children was high in Ulaanbaatar. Because such use leads to the spread of bacterial resistance to antibiotics and related health problems, our findings have important implications for public education and the enforcement of regulations regarding the sale of antibiotics in Mongolia.

Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

Introduction

The emergence and spread of resistance related to the irrational use of antibiotics is a major global public health problem.[1,2] The rapid increase in drug-resistant *Streptococcus pneumoniae* infections is a particular concern in paediatrics because pneumococci are the leading cause of bacterial meningitis, pneumonia, bacteraemia and otitis media in children.[3]

It is estimated that more than 50% of antibiotics worldwide are purchased privately without a prescription, from pharmacies or street vendors in the informal sector.[4] The situation in developing countries is of particular concern because the use of antibiotics without medical guidance is largely facilitated by inadequate regulation of the distribution and sale of prescription drugs.[5,6] Self-medication has also been noted in the United States of America and Europe, particularly for colds and upper respiratory tract symptoms, which are self-limiting and mostly caused by viruses.[7,8]

Studies from American, Asian and European countries indicate that between 22% and 70% of parents have misconceptions about the appropriate applications and efficacy of antibiotics[9,10] and often use them without a prescription.[11–13] Other determinants of self-medication with antibiotics in low-income countries include over-the-counter sales of antibiotics, the high cost of medical consultations and dissatisfaction with medical practitioners.[14]

Previous studies have suggested that increased antibiotic prescription might increase self-medication with antibiotics.[7,8,15] This may be of particular relevance in Mongolia, where injection usage is high (as in many other formerly Socialist countries), e.g. 13 injections per person per year,[16] and the prescription of antibiotics is widespread and often inappropriate.[17] Moreover, after the establishment of a market-based economy in 1990, the number of private pharmacies rose sharply in Mongolia. This has increased the use of medicines by the population. In July 2001, a ministerial decree announced measures to stop over-the-counter sales of non-prescribed drugs, but in practice this still happens.[18] Children are particularly prone to high rates of antibiotic use.[19] Many parents ask paediatricians for antibiotics for conditions such as viral upper respiratory tract infections, non-specific diarrhoea or sore throats.[20]

A qualitative survey reported that parents in Mongolia used antibiotics such as chloramphenicol to treat child diarrhoea,[21] and another study noted that 32–35% of families practiced self-injection at home.[22] To the best of our knowledge, however, no previous representative community-based studies in Mongolia have investigated the prevalence and determinants of caregivers' practice of using non-prescribed antibiotics to treat their children. Such studies are essential to obtain a clear understanding of the factors that underlie this practice and to develop measures to preventive antibiotic resistance and promote rational use. The aim of the present study was therefore to determine the prevalence of the administration of non-prescription antibiotics by caregivers to children younger than 5 years of age, and to identify factors associated with non-prescription use.

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Methods

Study site

The study site was Ulaanbaatar (population 1 million), the capital of Mongolia. This city is the main cultural, industrial and commercial centre in the country. About 39% of the country's population lives in this city, and 8.8% of its inhabitants are aged between 0 and 4 years.

Study design and sampling

A community-based, cross-sectional study was conducted in Ulaanbaatar in March–April 2009. Because of the absence of relevant data, we estimated a sample size of approximately 400 for an assumed prevalence of self-medication of 50%, a 95% confidence level and a 5% margin of error.[23] In a recent government survey, a non-response rate of 15% was assumed in the sampling design[24] and with this in mind, we adjusted the sample size by 30% to compensate for potential problems of non-response or incomplete survey reports.

To obtain a representative sample, two-stage cluster sampling was used to select 540 households. In stage one, 10 out of 132 subdistricts were selected by simple random sampling. In the second stage, we selected households from each sampled subdistrict by probability proportional to size, using a list of households that had children aged < 5 years. Because coverage under the National Expanded Programme on Immunization is approximately 97% in Mongolia,[25] we used the list of households from its records. For households with more than one child aged < 5 years, we selected one of the children at random from the list before visiting the household. We excluded households from the survey if parents or caregivers were not present at the time of the interview or if they refused to participate, if they were medical professionals, or if they did not understand what the word "antibiotics" meant.

Study tool

A structured questionnaire was developed with validated questions from previous studies.[10,25,26] The questionnaire consisted of sections on: (i) the socioeconomic and demographic characteristics of households; (ii) caregivers' knowledge and attitudes regarding antibiotic use to treat respiratory illnesses as well as about the usefulness of antibiotics for bacterial and viral infections; and (iii) the use of antibiotics for the index child in the previous 6 months. If mothers or caregivers reported that their child had taken antibiotics without a prescription, they were asked for further details concerning self-medication with antibiotics.

A multiple-choice question asked respondents to state their reasons for self-medication, describe the symptoms, identify the source, names and dosages of antibiotics, and state the duration of use. Symptoms were self-reported and based on codes in the *International classification of primary care*,[27] and antibiotics were defined as antibacterials for systemic use.[28] Parents and caregivers also reported whether they took antibiotics themselves without a prescription and whether they kept antibiotics at home.

The questionnaire was translated into the Mongolian language and back-translated into English. It was pre-tested on a small pilot population and revised on the basis of feedback from the pilot test. The chief investigator provided training in the content of the questionnaire and the purpose of the study to a team of experienced interviewers. Interviewers visited households and explained the purpose of the study to parents or caregivers and asked them to participate.

Statistical analysis

We used logistic regression to identify factors associated with the non-prescription use of antibiotics for children. Sample weights were used to minimize bias in the selection of a given child in a household. We included in the model only responses for households in which the main caregiver was the mother, as mothers clearly accounted for the largest proportion of persons responsible for dealing with children's illnesses. The dependent variable was whether a child had received non-prescribed antibiotics in the previous 6 months. Explanatory variables used in the analysis were sociodemographic variables, distance to a family practice facility, availability of antibiotics at home, mother's knowledge regarding upper respiratory tract infections and antibiotic use, tendency to demand antibiotics, and mother's own self-medication with antibiotics.

To measure the mother's knowledge, we recorded an antibiotics knowledge score as the number of correct responses to 10 questions which assessed her knowledge of appropriate antibiotic use. Mothers were considered to have a tendency to demand antibiotics if they responded affirmatively to two of the three questions about their expectations for antibiotics use. Sociodemographic variables included the mothers' education (years of school attendance ≤ 10 versus ≥ 11), mother's and child's age, and the wealth index score of households. The wealth index score[29] was recorded as a measure of household wealth status. We used principal components analysis to assign indicator weights according to the procedure used in the Demographic and Health Surveys.[30] For the statistical analysis we used SPSS version 16.0 (SSPS Inc., Chicago, USA). Statistical significance was set at $P < 0.05$.

Ethical approval for the study was obtained from the University of Tokyo and the Health Science University of Mongolia. Informed consent was obtained from individual respondents before each interview.

Results

In the 540 households visited, 24 parents or caregivers were unavailable at the time of the home visit, 3 parents were medical professionals and were not interviewed, and the results from 10 households were excluded because of incomplete information. The overall response rate was 93% (503/540).

Sociodemographic characteristics of respondents

Table 1 presents the sociodemographic characteristics of the participants, 71% of whom were mothers. The mean age of the participants was 35.4 years (standard deviation, SD: ± 11.9), and 53.7% reported having an undergraduate university education or higher. The average number of household members was 4.3 (SD: ± 1.1), and 39% of households had 5 or more family members. Most participants belonged to the Khalkh ethnic group and 73.6% were Buddhists.

Non-prescription use of antibiotics

Antibiotics had been given to 71% (356/503) of the children during the 6-month period before the study. About one-fifth (21%) of the 503 children had taken antibiotics without a prescription, and both prescribed and non-prescribed antibiotics were used concomitantly in 21%. In all, 42.3% (95% confidence interval, CI: 37.8–46.9) of the children were given non-prescribed antibiotics. Responses to a multiple-choice ques-

tion showed that fewer than half of the respondents (210/503) had given antibiotics to the index child without a prescription for symptoms of upper respiratory tract infection such as cough (84%), fever (66%) or nasal (65%) and throat symptoms (60%). The main source of non-prescribed antibiotics was pharmacies (86%). Amoxicillin was the most commonly used non-prescribed antibiotic (58%), followed by ampicillin (25%), erythromycin (6%), chloramphenicol (5%) and trimethoprim–sulfamethoxazole (5%). Most children took non-prescribed antibiotics for a period of 3 to 5 days (76%). Additionally, 8% of the children were treated with two non-prescribed antibiotics simultaneously, and 5% were given parenteral antibiotics if they had a sore throat with fever and cough or shortness of breath. Of the non-prescribed antibiotics, 31% were given on the advice of pharmacists, 35% on the advice of family members and 8% on the advice of friends. Reasons for not seeking a physician's advice included the belief that the illness was not severe (70%) and previous experience with the doctor always prescribing the same antibiotics for similar conditions (15%). Past experiences and familiarity with a drug were the main reasons for selecting a particular antibiotic (82%).

Table 1. **Characteristics of sample of caregivers (n=503) and children included in survey on the non-prescribed use of antibiotics for children in Ulaanbaatar, Mongolia, 2009**

Characteristic	Value
Caretaker	
Relationship to child, no. (%)	
Mother	356 (71)
Father	66 (13)
Grandparent	81 (16)
Mean age, years (SD)	35.4 (11.9)
Education, no. (%)	
General[a]	183 (36.4)
College[b]	50 (9.9)
Institute or university[c]	270 (53.7)
No. of people in the household, mean (SD)	4.3 (1.1)
Religion, no. (%)	
Buddhist	370 (73.6)
None	114 (22.7)
Other	19 (3.4)
Ethnicity, no. (%)	
Khalkh	450 (89.5)
Other	23 (11.5)
Child	
Mean age, in months (SD)	28.3 (15.7)
Male, no. (%)	264 (52.5)

SD, standard deviation.
[a] General education: 10 years of basic education from ages 8 to 18 years.
[b] College education (vocational training): an additional 2 years of education following basic education (i.e. up to 12 years of education in total).
[c] Institute or university education: an additional 4 years of education following basic education (i.e. up to 14 years of education in total).

Knowledge about antibiotic use

Table 2 shows participants' knowledge of the appropriate use of antibiotics based on response alternatives from the Centers for Disease Control and Prevention (Atlanta, United States) as adapted by Huang et al.[10] The median number of questions that were correctly answered was four (range: 0–10). Many respondents gave incorrect answers about antibiotic use for colds or flu (83%), a cough (81%), sore throat (74%) or purulent nasal discharge (64%). There was also a lack of understanding of antibiotic use for clear nasal discharge (runny nose) and middle ear fluid: about half the respondents answered incorrectly. Most participants (96%) incorrectly believed that most colds and cases of flu were caused by bacteria, and 76% incorrectly believed that antibiotics would accelerate recovery from these illnesses. A tendency to demand antibiotics was noted in 27% of participants.

Multivariate logistic regression

The odds ratios (ORs) for factors associated with the non-prescription use of antibiotics by the mother are shown in Table 3. Non-prescription use was positively associated with keeping antibiotics at home (95% CI: 1.04–2.79) and self-medication with antibiotics (95% CI: 3.8–10.5). Mothers with a higher score for knowledge of antibiotics were less likely to give their children antibiotics without a prescription (95% CI: 0.6–0.8), whereas respondents answering affirmatively to two or more items that investigated antibiotic demand were more likely to use non-prescribed antibiotics (95% CI: 1.4–4.0). The likelihood of treating a child with non-prescribed antibiotics increased with children's age (95% CI; 1.01–1.04).

Discussion

This study is the first community-based survey of non-prescription use of antibiotics in Mongolia. In both developed and developing countries, self-medication with antibiotics is common for illnesses presumed to be caused by a virus.[11,13,31,32] Although this practice is well known, few previous studies have used research methods that allow their findings to be compared with those from earlier studies. However, the methods used in the present study make it possible to document that the prevalence of non-prescription use of antibiotics for children in Ulaanbaatar, Mongolia is higher (42%) than in earlier reports from rural communities in Viet Nam (12%) based on a 2-week recall period,[13] and from a Chinese city (35.7%) where the recall period was 12 months.[11]

Acute respiratory infection was the condition associated most frequently with non-prescription antibiotic use, a result which substantiates findings from other Asian countries.[11,13] Our results are also consistent with findings in China, where low-severity illness was a major reason for giving children antibiotics.[11] Most of our respondents used antibiotics because they considered themselves to be knowledgeable about antibiotic use, based on their past experience. This reason runs counter to findings from other developing countries, where relatively lower costs have been given as the main reason for self-medication.[33,34] The difference in motives may be related to good health insurance coverage in Mongolia, especially

Table 2. **Knowledge regarding appropriate antibiotic use and tendency to demand antibiotics among caregivers (n=503) in Ulaanbaatar, Mongolia, 2009**

Item	Response	No.	%
Questionnaire item	**Acceptable response[a]**		
How often are antibiotics needed for the following?			
Middle ear fluid without fever	Never/almost never	217	54
Clear nasal discharge (runny nose)	Never/almost never	237	47
Purulent nasal discharge	Never/almost never	179	36
Sore throat	Sometimes/almost never	130	26
Colds or flu	Never/almost never	84	17
Cough	Never/almost never	94	19
Ear infections	Sometimes/almost always	315	63
Are antibiotics helpful for treating bacterial infections, viral infections, or both?	Bacterial	100	20
Do most cold, cough and flu illnesses get better faster with antibiotics?	Disagree or strongly disagree	120	24
Are most cough, cold and flu illnesses caused by bacteria or viruses?	Viruses	22	4
Demand-related items	**Affirmative response[a]**		
If I expected an antibiotic, I am less satisfied with a doctor's visit if I do not receive an antibiotic.	Strongly agree or agree	150	30
I would rather give my child an antibiotic that may not be needed than wait to see if s/he gets better without it.	Strongly agree or agree	184	37
If a doctor does not prescribe an antibiotic when I think one is needed, I will take my child to another doctor.	Strongly agree or agree	137	27

[a] Acceptable and affirmative responses were adapted from reference Huang SS et al.[16]

in urban areas, where health services are free for children.[35,36]

Although the non-prescription sale of antibiotics is illegal in Mongolia,[18] our results replicate findings from other studies in settings where pharmacies were the main source of antibiotics for self-medication.[11,32,37] In contrast, countries where over-the-counter antibiotics sales are strictly regulated have much lower prevalence rates of self-medication with antibiotics, ranging from 1% to 4%.[31] The widespread availability of antibiotics without a prescription has given rise to concerns about their increased usage.[38] The uncontrolled use of antibiotics can be harmful because of adverse drug reactions, masking of symptoms of infection, the development of chronic disease and superinfection. It is also associated with the emergence and spread of antimicrobial resistance.[39] These problems require appropriate measures by policy-makers to develop pertinent policies as well as to ensure their implementation.

Keeping antibiotics at home was another important factor linked to the non-prescription use of antibiotics for children.[40] Leftover antibiotics may be available because of over-prescription or patient non-compliance with a course of treatment. It is therefore essential for physicians to appropriately prescribe the correct dosage, properly instruct patients to complete antibiotic courses, and encourage them to discard any leftover drugs.[7]

We found that 49.7% (250/503) of the children in households that participated in this study used prescribed antibiotics, and 50.2% (107/213) of the children who were given antibiotics by their caregiver used both prescribed and non-prescribed antibiotics. This practice can be traced back to Soviet-influenced health care practices, which included the prescription of heavy medication and injection usage.[41] Effective strategies to reduce the use of antibiotics include the development of policies to support the judicious use of antibiotics, strengthen the control of antibiotics consumption in clinical practice, and implement educational campaigns for prescribers.[42,43]

In line with another study,[11] we found that higher age of the index child was linked to a greater likelihood of parental non-prescription use. When younger children become ill, parents may

Table 3. **Odds ratios for risk factors linked to the use of non-prescribed antibiotics for children among mothers (n=465)[a] included in survey in Ulaanbaatar, Mongolia, 2009**

Independent variables	Value	95% CI	OR	95% CI
Distance to family medical facility (%)				
≤10 minutes	55.3	50.6–60.1	1.0	–
11–20 minutes	25.5	21.6–29.9	1.1	0.6–2.0
>20 minutes	19.1	15.6–23.2	1.6	0.8–3.1
Keeping antibiotics at home (mean no.)	58.4	53.6–63.0	1.7	1.04–2.79
Mean age of mothers (years)	30.3	29.8–30.8	1.0	0.9–1.07
Mother's education >10 years (%)	69.0	64.4–73.3	1.2	0.7–2.2
Mother having self-medicated with antibiotics (%)	34.8	30.4–39.5	6.3	3.8–10.5
Tendency to demand antibiotics (%)	27.0	23.0–31.5	2.4	1.4–4.0
Knowledge about URTIs and of antibiotics (mean score out of 10)	3.5	3.3–3.7	0.7	0.6–0.8
Wealth index score[b]	–0.01	–0.10–0.08	0.9	0.7–1.2
Mean age of index child (months)	28.7	27.2–30.3	1.02	1.01–1.04

CI, confidence interval; OR, odds ratio; URTI, upper respiratory tract infection.

[a] For the logistic regression analysis, only responses from households in which the primary caregiver was the child's mother were included.

[b] Calculated as described in Rutstein SO & Johnson K.[29]

be more careful and concerned and more likely to visit a doctor, whereas when the children are older, parents may have more knowledge about common illnesses and be more inclined to administer medical treatments themselves.

In countries that restrict over-the-counter antibiotics sales, studies of antibiotic use and parental knowledge have shown that patient's expectations about antibiotics influence their prescribing behaviour.[3,9,10,44] These findings mirror those in our study: parents' past experience, expectations and knowledge level appeared to influence non-prescription medication practices. In particular, caregivers who had medicated themselves with antibiotics were more likely to give antibiotics to their children without a prescription.

Caregivers also had misconceptions about self-medication. Most respondents in our study believed that antibiotics were needed for colds or flu, purulent nasal discharge and cough, even though these are typical manifestations of upper tract respiratory infections, most of which are caused by viruses. Past exposure was also an influence: if antibiotics were previously prescribed for an infection and the child later developed similar symptoms, than a caregiver was more likely to use antibiotics.[44] Educational interventions for caregivers regarding acute respiratory tract infections and antibiotic use can reduce the inappropriate use of antibiotics. Previous interventions have included the distribution of educational materials to hospitals and pharmacies, and the communication of information through the media.[9,42,45]

The use of non-prescribed medications for children might be a consequence of poor oversight of community pharmacies, and the widespread availability of medicines has probably contributed to an increase in this phenomenon. Interventions in other developing countries that have reduced over-the-counter antibiotic sales suggest, however, that this situation can be changed. In Chile, the prohibition of over-the-counter sales of antibiotics and a simultaneous public education campaign had an immediate and significant impact on the acquisition of antibiotics from pharmacies.[1] Similarly, sales of antibiotics without prescription in Zimbabwe decreased when the law against over-the-counter sales was strictly enforced. Fear of losing their license was a factor mentioned by some pharmacists for their compliance.[46]

This study has several limitations. Caregivers' self-reports about non-prescription use may be subject to recall bias. To minimize this possibility we limited the recall period to the previous 6 months, and attached a list of the most commonly used antibiotics to the questionnaires. We also asked participants to show us the antibiotics they kept at home. Another limitation is that findings from this urban sample cannot be generalized to the whole population of Mongolia. This would overestimate the prevalence of non-prescription antibiotic use since this study was done in the capital city, where access to pharmacies and information are higher than in rural settings. To better study this issue, future research should focus on both urban and rural areas, and should involve both prescribers and pharmacists. Additionally, seasonal variations in illnesses should also be taken into consideration, because they may have affected disease patterns and antibiotic use. As shown in a multi-country study in Europe, the attitudes and behaviour of health personnel may also reinforce self-medication with antibiotics,[14] although these factors were not examined in the current study. In the future, questions relating to the prescription of antibiotics, the doctor–patient relationship, patient satisfaction and perceived accessibility of health care should be included in survey instruments. The information obtained with these items will result in a better understanding of the determinants of non-prescription antibiotic use in Mongolia. Despite these limitations, our findings shed light on the relative importance of demand-side determinants related with non-prescription antibiotic use for children and the interventions needed to prevent this misuse.

Conclusion

The present study suggests that caregivers in Ulaanbaatar commonly use non-prescribed antibiotics for children younger than 5 years of age. Some determinants of this practice were the child's age, caregivers' misconceptions about the efficacy of antibiotics for upper respiratory tract infections, caregivers' own experience with self-medication, and the availability of antibiotics at home. Interventions aimed at preventing the unsanctioned use of antibiotics should be directed primarily at reducing the availability of non-prescribed antibiotics and educating the general public to dispel misconceptions about the use of antibiotics. ■

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ملخص

مسح عن استخدام أدوية الأطفال بدون وصفات طبية في مجتمع حضري في منغوليا

الغرض تقدير الانتشار والتعرف على محددات استخدام أدوية الأطفال بدون وصفات طبية في منغوليا.

الطريقة أُجْرِيَ مسح المقطع العرضي المرتكز على المجتمع في عشر مناطق فرعية في مدنية آولان باتار، عاصمة منغوليا. واستخدم الباحثون استبياناً لجمع المعطيات من عينة عشوائية مكونة من 540 أسرة لدى كل منها طفل واحد على الأقل دون عمر خمس سنوات. وأجري اختبار التحوف اللوجستي لتحديد العوامل المرتبطة بسوء استخدام المضادات الحيوية.

الموجودات من بين 503 من مقدمي الرعاية المشاركين في الدراسة، كوّنت الأمهات 71% منهم؛ استخدم 42.3% من مقدمي الرعاية (فاصلة الثقة 95%: 37.8 – 46.9) مضادات حيوية بدون وصفات طبية لمعالجة الأعراض التي ظهرت على أطفالهم خلال الشهور الستة السابقة. واشتملت الأعراض الشائعة التي عولجت على السعال (84%)، والحمى (66%)، ورشح الأنف (65%)، والتهاب الحلق (60%). وكان أموكسيسيلين هو أكثر المضادات الحيوية استخداماً (58%). وكانت الصيدليات هي المصدر الرئيسي لصرف الأدوية بدون وصفات (86%). وارتبط استخدام الأمهات للدواء بدون وصفات بالإبقاء على المضادات الحيوية في المنزل (نسبة الأرجحية: 1.7؛ وفاصلة الثقة 95%: 1.04 – 2.79)، والمعالجة الذاتية لمقدمي الرعاية (نسبة الأرجحية: 6.3؛ فاصلة الثقة 95%: 3.8 – 10.5)، وكبر عمر الطفل (نسبة الأرجحية: 1.02؛ فاصلة الثقة 95%: 1.01 – 1.04). أما مقدمو الرعاية الذين لديهم معرفة أفضل عن المضادات الحيوية فكان من الأرجح عدم إعطائهم