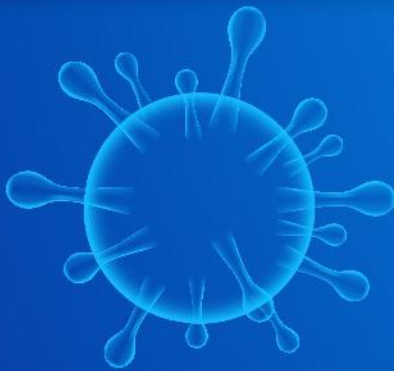


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Concomitant Prevalence of Non-Communicable Diseases among NAFLD/NASH Patients: An Experience from a Tertiary Care Hospital in Delhi

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ABSTRACT

Background: Non-alcoholic fatty liver disease (NAFLD) or non-alcoholic steatohepatitis (NASH) is a multisystem disease and involves extra-hepatic organs and thus have strong association with components of metabolic dysfunction. Presence of single component of the metabolic dysfunction anticipates the appearance of additional metabolic components over time. With this objective, the present study aims at assessing the proportion of various metabolic components in NAFLD/NASH patients attending tertiary care hospital. **Methodology:** A record review was undertaken to extract the data of NAFLD/NASH patients who were presenting to outpatient clinics or/and inpatient wards in Department of Hepatology from August 2009 to March 2020. Medical records of NAFLD/NASH patients were extracted in pre-defined format. In case several visits of the patients were reported, the first visit was considered using unique hospital Identity number. The data was analyzed in STATA version 14. p-value of <0.05 was considered to be significant. **Results:** A total of 1398 patients were included in the final analysis. Mean age of patients was 54.4±11.9 years and 76% were males. The median ALT and AST was found to be 35 IU/l (IQR: 24 -56 IU/l) and 48 IU/l (IQR: 34–74 IU/l) respectively. The obesity (66.45%) and diabetes (51.86%) were found to be the most common non-communicable diseases associated with NAFLD/NASH patients. The odds of cirrhosis (LSM≥13) was 6.13 (95%CI: 4.43 – 8.48) times among diabetics as compared to odds of non-cirrhosis (LSM≥13) among non-diabetics (p <0.001). The univariate association with obesity and hypertension was also found to be significant. **Conclusion:** There is higher prevalence of non-communicable diseases among NAFLD/NASH patients.

Keywords: Non-communicable diseases, NAFLD, Prevalence

Introduction

Non-alcoholic fatty liver disease (NAFLD) is the most common liver disorders in western world [1, 2] and is emerging as the major cause of liver diseases in developing countries like India, with a prevalence ranging from 9% to 55% in general population [3, 4]. Prevalence of non-alcoholic steatohepatitis (NASH), a progressed form of NAFLD is estimated to be 1.5–6.45% in the general population whereas prevalence of NASH among biopsy confirmed NAFLD cases is 59.10% (95% CI: 47.55-69.73) [5, 6].

Earlier, NAFLD was considered to be a benign condition, however with advancements in imaging and medical technology, it has now being recognized as a disease with liver-related morbidities which can progress to cirrhosis, liver failures and hepatocellular

carcinoma [7]. Over the years, it has been found that the clinical burden of NAFLD is not only restricted to liver-related morbidity and mortality, rather evidences suggest NAFLD to be a multisystem disease, involving extra-hepatic organs and several regulatory pathways. A meta-analysis of 86 studies with a sample size of 8,515,431 from 22 countries reported strong association of NAFLD with obesity (51.34%; 95% CI: 41.38-61.20), type 2 diabetes mellitus (T2DM) (22.51%; 95% CI: 17.92-27.89), hyperlipidemia (69.16%; 95% CI: 49.91-83.46%), hypertension (39.34%; 95% CI: 33.15-45.88), and metabolic syndrome (42.54%; 95% CI: 30.06-56.05)[1]. Thus, these evidences from clinical, experimental and epidemiological studies indicate strong association of NAFLD with components of metabolic dysfunction,

indeed NAFLD is considered to be the hepatic manifestation of metabolic dysfunction [8].

The pooled prevalence of NASH among T2DM patients was reported to be 37.3% (95% CI 24.7-50.0%) [9]. In addition to this, patients with NAFLD have higher risk of CVD-related mortality as compared to their counterparts in general population (15.5% versus 7.5%; $P=0.04$) [7]. Further, several studies have supported the concept that NAFLD and NASH anticipates the development of T2DM and metabolic syndrome [10, 11]. However, there is a continued scientific debate about the primacy of metabolic components over NAFLD or, conversely, NAFLD over the metabolic components [12].

Nevertheless, the presence of single metabolic conditions tends to aggregate in the individuals and the presence of each of the trait anticipates the appearance of additional metabolic components over time [13]. This aggregation of traits together result in progression of the disease to cirrhosis and development of hepatocellular carcinoma [14, 15]. Thus, it is important to study the clinical profile of NAFLD/NASH patients to understand the proportion of various metabolic conditions. With this objective, the present study aims at assessing the proportion of various metabolic components in NAFLD/NASH patients attending tertiary care hospital.

Methodology

Study design and setting

A record review was undertaken to extract the data of NAFLD/NASH patients who were presenting to outpatient clinics or/and inpatient wards in Department of Hepatology at the Institute of Liver and Biliary Sciences, New Delhi, from August 2009 to March 2020. ILBS is tertiary care hospital under Government of National Capital Territory of Delhi which provides specialized care in the field of liver and biliary diseases.

Study population

Inclusion criteria:

1. Age >18 years
2. Patients with NAFLD/NASH confirmed based on their histological and/or radiological features.

Patients with cryptogenic fibrosis or cirrhosis in absence of significant alcohol consumption (>30gm/day in men and >20gm/day in women) [16] and absence of other liver related etiologies like viral hepatitis, liver-related autoimmune liver diseases, cholestatic or drug-induced liver injuries were also considered as NAFLD/NASH cases in the analysis [17].

Exclusion criteria:

1. Patients who were found to be positive for HBsAg and HBV-DNA.
2. Patients who were positive for Anti-HCV [18].

Operational definitions

Patients were considered to be diabetic as per the criteria defined by American Diabetes Association (fasting plasma glucose above 126mg/dl or oral glucose tolerance test above 200 mg/dl or HbA1C above 6.5%) [19], or those already on treatment with oral hypoglycemic or had mention of history of diabetes in his/her case report. Patients were considered to be hypertensive as per the definition provided by American Heart Association (systolic blood pressure above 140 mmHg and/or diastolic blood pressure above 90 mmHg) or those are on antihypertensive medications or had mention of history of hypertension in his/her case report [20]. Obesity was defined as BMI above 24.99 kg/m² or had mention of overweight or obesity in their case report.

The medical records of NAFLD/NASH patients who visited outpatient clinics or/and inpatient wards in Department of Hepatology at the Institute of Liver and Biliary Sciences, New Delhi, from Aug 2009 to Mar 2020 were extracted in pre-defined format with necessary variables. In case several visits of the patients were reported, the first visit was considered and remaining visits were removed from the final list of analysis using unique hospital Identity (UHID) number. This was done to ensure inclusion of unique entries as well as presentation of case at his/her first time of visit to the hospital. Since it was a record review, all eligible NAFLD/NASH patients were included in the analysis.

The study conformed to the Declaration of Helsinki of 1975, as revised in 1983, and was undertaken with the permission of competent authority as well as Institutional Ethics Committee approval via letter F.37/(1)/9/ILBS/DOA/2020/20217/321 dated May 1, 2020. Since it was a record review, informed consent of patients was not required and to maintain the confidentiality of the patient, data was made anonymous by deleting the personal details such as name and address, henceforth using UHID as the unique number.

The data was analyzed in STATA version 14. Proportion, mean with standard deviation (SD) and median with inter quartile range (IQR) were used to provide descriptive statistics. A univariate analysis was performed using chi square where p value of <0.05 was considered to be significant. Odds ratio (OR) along with 95% Confidence intervals (CI) was provided to represent the association between cirrhotic status and other non-communicable diseases.

Results

A total of 89,448 records of NAFLD/NASH patients from Aug 2009 to Mar 2020 were found. Out of which, 82,794 records were found to be multiple entries of the same patients due to their several follow up visits to ILBS. A total of 1398 patients were included in the final analysis after exclusion of

multiple entries of same patients (82,794) and incomplete or missing data (5,256) as seen in Figure 1.

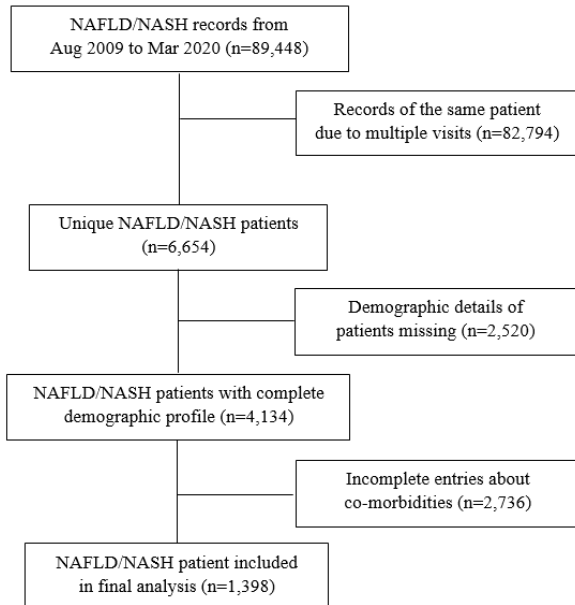


Figure 1 Flowchart of inclusion of NAFLD/NASH selection process followed for the impact assessment study

The mean age of participants was found to 54.4±11.9 years and 76% of the participant were males. The median ALT and AST was found to be 35 IU/l (IQR: 24-56 IU/l) and 48 IU/l (IQR: 34 – 74 IU/l) respectively. The mean BMI of the included NAFLD/NASH patients was found to be 26.24±3.89 kg/m². The median value of Liver stiffness measurement (LSM) was found to be 20.6 kPa (IQR: 7.55 – 42.05 kPa) (Table 1).

Table 1. Clinical profile of patients having NAFLD/NASH (N =1398)

Characteristics	n (%)
Mean Age (SD)	54.4 (11.9)
Gender	
- Male	1,061 (75.89)
- Female	337 (24.11)
Mean BMI (kg/m ²)	26.24 (3.89)
BMI Category	
<18.5	38 (2.72)
18.5 – 24.9	444 (31.76)
24.9 – 29.9	713 (51.00)
>30	203 (15.52)
Median ALT (IQR), (n=1,172)	35 (24 -56)
Median AST (IQR), (n=1,176)	48 (34 – 74)
Median Liver stiffness measurement (IQR), (n =828)	20.6 (7.55 – 42.05)

History of diabetes was found to be among 51.86% of the participants whereas hypertension was found among 14.16% of the participants and more than

two-third of the participants were obese as represented in table 2. The obesity (66.45%) and diabetes (51.86%) were found to be the most common non-communicable diseases associated with NAFLD/NASH patients. The coexistence of obesity among diabetic NAFLD/NASH patients was found to be 67.31% whereas the concomitant prevalence of obesity among hypertensive NAFLD/NASH patients was found to be 63.63%. The presence of diabetes among hypertensive NAFLD/NASH group was found to be 77.78% and 52.53% in obese NAFLD/NASH group as seen in figure 2. Approximately 15% were found to have no component of metabolic dysfunction, whereas at least one metabolic condition was present in 85% of the patients. The coexistence of all the three factors: obesity, diabetes and hypertension among NAFLD/NASH patients was found to be 6.87% (Table 2).

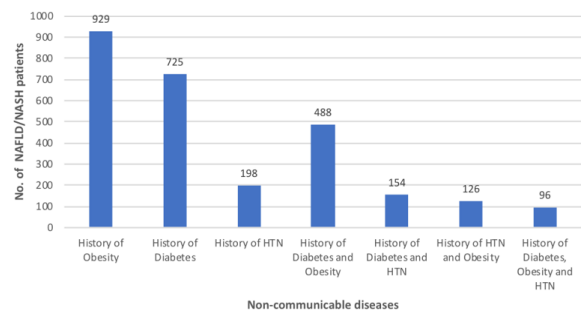


Figure 2 Co-existence of non-communicable diseases among NAFLD/NASH patients

Table 2. Concomitant existence of non-communicable diseases in NAFLD/NASH patients (N =1398)

Non-communicable disease	n (%)
Patients having:	
- No component of metabolic dysfunction	218 (15.59)
- One component of metabolic dysfunction	604 (43.20)
- Two components of metabolic dysfunction	480 (34.33)
- Three components of metabolic dysfunction	96 (6.87)
History of Diabetes	725 (51.86)
History of HTN	198 (14.16)
History of Obesity	929 (66.45)
History of Diabetes and Obesity	488 (34.91)
History of Diabetes and HTN	154 (11.02)
History of HTN and Obesity	126 (9.01)
History of Diabetes, Obesity and HTN	96 (6.87)

The odds of cirrhosis (LSM≥13) is 6.13 (95%CI: 4.43 – 8.48) times among diabetics as compared to odds of non-cirrhosis (LSM≥13) among non-diabetics (p <0.001). The univariate association with obesity and hypertension is also found to be significant as described in table 3.

Table 3 Association of non-communicable diseases on Liver stiffness measurement values (N=828)

Presence of non-communicable diseases	n (%)		Odds ratio (95% CI)	p-value
	Non-cirrhosis LSM <13; n=322	Cirrhosis (LSM≥13); n=506		
Obesity	206 (35.9)	368 (64.1)	1.50 (1.11 – 2.03)	0.008
Diabetes	66 (17.5)	310 (82.5)	6.13 (4.43 – 8.48)	<0.001
Hypertension	31 (26.1)	88 (73.9)	1.97 (1.27 – 3.06)	0.002

Discussion

NAFLD is a multi-system disease which is known to be the hepatic manifestation of metabolic dysfunction. Thus, NAFLD is associated with several non-communicable diseases such as diabetes, obesity and hypertension. Among 1328 NAFLD/NASH patients, at least one component of metabolic dysfunction was present in 96.1% and a small proportion of approximately 15.% didn't have any components of metabolic dysfunction. These findings are in line with a previous study undertaken in general population of blood donors from India [4].

Diabetes and obesity were found to be the most common non-communicable disease co-existing with NAFLD/NASH conditions in the present study. Although diabetes and obesity are well established risk factors of NAFLD, however, the actual pathological mechanism by which they induce NAFLD is unclear. It is uncertain whether obesity or diabetes induces NAFLD or whether there is an overlapping pathophysiological mechanism between them.

Majority of the NAFLD/NASH patients in the study were diabetics and consequently, have nearly six fold higher odds of having liver cirrhosis. The similar findings have been reported by a previous study where presence of diabetes increased the risk of NAFLD by three-folds. The underlying biological mechanism of the association is not fully illustrated, however, traces of liver inflammation, metabolic stress and insulin resistance can be figured between diabetes and NAFLD/NASH conditions. Further according to US-based population study NAFLD and diabetes were the first two common factors seen in patients suffering from hepatocellular carcinoma (HCC) [21]. In addition to this, presence of diabetes can independently increase the risk of developing HCC by two-to-three-folds indicating a strong role of diabetes in progression of NAFLD [22].

The odds of cirrhosis was also observed to be higher in those with obesity and having hypertension. It has been observed in several studies, prevalence of NAFLD increased with increasing BMI. The coexisting prevalence of obesity with NAFLD as observed from previous studies is found to be 72-90% [23]. Similar higher prevalence was observed in healthy individuals from India in an earlier study [24].

One of the limitations of our study is that information of various confounding factors such as socioeconomic, physical activity, diet which may have an influence on the high prevalence of metabolic risk factors and NAFLD in them were missing because the present study was a record review rather than a prospective data collection study. In addition to this, the study predominantly includes males and hence there could be an overestimation of the non-communicable diseases as males are more susceptible to such diseases. However the paucity of the female gender in our study could be the true reflection of the differential gender distribution among the NAFLD/NASH patients at our institute. Thus, the results of the present study can't be generalized to the whole country. Further the years of existence of the disease also effects the coexistence of non-communicable disease, however, since it was a record review information about the duration of the disease could not be extracted. Thus a prospective data collection study should be planned to overcome the limitations of the study and to estimate the true concomitant prevalence of non-communicable diseases among NAFLD/NASH patients.

Conclusion

There is higher prevalence of NAFLD with other non-communicable diseases such as obesity, diabetes and hypertension, indicating the expansion of a modern lifestyle epidemic in the population and thus would require necessary preventive strategies at various health system levels to control this lifestyle epidemic. As NAFLD is a multi-system disease, it requires a multi-disciplinary assessment which can initiate early treatment measures to decrease the diseases burden.

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The UNESCO Highland Peoples Surveys: Tracing Inequalities in Health Care Access and Provision in Northern Thailand

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ABSTRACT

Thailand's public health system is lauded globally for its broad access and coverage. However, significant gaps in health outcomes persist for diverse highland Indigenous and ethnic minority communities that have historically resided along the country's northern and northwestern border region. Yet, Thailand's census data do not tabulate ethnicity, and therefore preclude assessments of health barriers and progress among ethnic minority groups anywhere in the country. Moreover, state surveys of highlanders, often undertaken for surveillance purposes in the mid-to-late 20th century, never included measures of health, educational attainment, wealth, or other indices of inequality. Beginning in 2005, UNESCO undertook a sequential, mixed-methodological research program in the highlands to assess progress and barriers in citizenship acquisition and inequalities related thereto. In the Highland Peoples Survey (HPS) I, more than 60,000 people in nearly 200 villages in 3 provinces were surveyed, and in the HPS II, more than 70,000 people representing 18 ethnic groups in over 300 villages in 5 provinces were surveyed. In addition to providing a detailed overview of the unique utility of the UNESCO Highland Peoples Surveys for ascertaining complex dynamics of ethnicity, legal status, wealth, and health care availability for highlanders, this article presents a broad exploration of health access detected in the 2010 survey, and thus provides a baseline of health inequalities among highlanders from which future comparative analyses may be drawn.

Keywords: *Indigenous health, Ethnic minority health, Legal Status, Wealth, Health Disparities, Thailand*

Introduction

Thailand's public health system is lauded globally for its broad access and coverage. However, for Indigenous and ethnic minority communities who have historically resided in the country's north and northwest border regions, significant gaps persist in health outcomes, health services availability, and health care access. Many studies indicate that highlanders suffer from poor health outcomes [1-4], reduced or poor access to public health information and services [5, 6], and generally low quality of care in highland clinics [e.g., [6-9]], but small sample sizes preclude comparisons between highlanders and Thais, or between highlander groups themselves. In addition, long-standing state policies of neglect, discrimination, and exclusion of highlanders, particularly from Thai

citizenship, are likely contributing to both continuing and new forms of health inequalities associated with legal status [10-16]. Indeed, even though the state officially extends health care to non-citizens, statelessness is associated with migration and education inequalities, which can therefore structure intergenerational inequalities that may contribute to poor health outcomes at individual and household levels, in particular [17]. Furthermore, concerns regarding geographical proximity to health care services, and quality of care in health facilities--including discriminatory attitudes toward highlanders--persist [18], potentially exacerbating unequal outcomes both within- and between- communities.

Each of these studies points to potentially significant challenges to Thailand's progress in health

care provision. However, no large-scale assessment of the extent of barriers to and progress in health care provision and access for highlanders exists because Thailand's census data do not tabulate ethnicity or legal status. Moreover, state surveys of highlanders, often undertaken for surveillance purposes in the mid-to-late 20th century, have not included measures of health, educational attainment, wealth, or other indices of inequality. To this end, tracing the extent of health care inequities in the highlands is critically needed.

The UNESCO Highland Peoples' Surveys (HPS I and II) are the only village censuses of highland communities designed to collect a wide range of information about ethnicity, legal status, household assets and land, access to education, and basic health services access and availability, as well as inequalities related thereto. The governing methodology of the UNESCO highland project dictated that surveys be developed based upon rounds of intensive ethnographic research. Carried out in partnership with the Royal Thai Government's Bureau of Social Development and Human Security (BSD) first in 2005-2006, the initial wave of the UNESCO HPS covered over 60,000 people in 192 villages in Mae Hong Son, Chiang Mai and Chiang Rai provinces.^{1/} Questionnaires focused primarily on individual-level data, which could be aggregated to understand patterns at household and village levels. Findings from the first round of the survey, coupled with follow-up interviews and more rounds of ethnographic engagement, revealed that significant patterns of inequality in access to education and health services were emerging along lines of legal status and ethnicity in border communities [18-20]. At the same time, however, measures of legal status were not sufficiently elaborated, and gaps in information regarding village- and household-level context precluded robust analysis of barriers to citizenship, schooling, and health care. Therefore, in 2010, UNESCO and the BSD embarked on a larger study of statelessness, which covered 71,000 people representing 18 ethno-linguistic groups across 292 villages along the international border in Chiang Rai, Chiang Mai, Mae Hong Son, Tak and Kanchanaburi provinces. To account for the diverse contexts in which individuals attempt to acquire recognition of citizenship, the HPS II also included village and household modules, as well as modules for village schools and the teachers who staff them. In the sections that follow, we provide a detailed overview of the methodologies that informed these surveys and an analysis of health inequities detected in the HPS II related to ethnicity, legal status and geographical factors.

Overview of UNESCO highland people's surveys Sampling frames

For the HPS I (2006), border villages in Chiang Mai, Chiang Rai, and Mae Hong Son provinces were selected by the BSD as part of the agency's semi-regular assessment of well-being in highlander communities. Of its official roster of 3,881 "hill tribe" villages located across 20 provinces (see [21]) the state limited the study to border communities in the three northernmost provinces where highlanders constitute the largest proportion of the total population. In the HPS II (2010), the roster was extended to border villages in Tak and Kanchanaburi provinces as well. The BSD's definition of "border village" is any community where villagers reside or farm within 20 kilometers from the international border. For security purposes, only villages located outside of military zones were included to ensure the safety of both BSD staff and village residents. Finally, by a purposive survey of the border, rather than a random sample of all highland villages, ensured the inclusion of numerically very small groups like Mlabri and H'tin, who would have been excluded in a random sample of the same size.

In both HPS rounds, Chiang Mai, Chiang Rai, and Mae Hong Son provinces, every household that opted to participate was interviewed. Village participation rates varied between 94% and 99%, because 1) villagers collectively elected to participate during community meetings about human subjects concerns (see below), and 2) villagers understood the critical need to understand barriers to legal status, in particular. Households that did not provide data were largely unavailable due to extended travel or work outside of the community and could not be reached. In Tak and Kanchanaburi provinces (HPS II, only) 25% of households were randomly selected for interviews, although participation rates of selected households were similarly high. Indeed, in all villages for which detailed reports exist, BSD staff had to decline to interview at least one household that had not been selected (for more details, see [22]).

Data collection: validity, reliability, and ethics

Due to the scope, detail, and focus of both HPS instruments, ensuring robust and ethical data collection efforts among the vast and extremely diverse highland population on sensitive topics requires implementation by a uniquely capable government partner known to villagers. For this reason, the Bureau of Social Development and Human Security (BSD)^{2/} was the implementing agency for both HPS rounds. As the state agency mandated with accounting for and distributing various welfare and disability payments, the BSD carried out a general survey of village needs in 1997, and then partnered with UNESCO for HPS I and HPS II.

^{1/} The HPS initiatives were part of the UNESCO Highland Birth and Citizenship Registration Promotion Project, undertaken by the regional UNESCO HIV/AIDS and Trafficking Program, and first piloted in 2001.

Like all government bureaucracies, the BSD is organized hierarchically, with primary authority housed in provincial offices and a central Bangkok office. However, staff in district offices are generally hired from communities located within the office's jurisdiction. As such, implementing staff of the HPS spoke at least one of the main languages spoken by local communities in addition to Central Thai and Kam Muang (Northern Thai), a language that is widely spoken and understood by villagers in the area [22]. After pilot-testing the survey instrument in Thai, Northern Thai, Akha, Lahu, Lisu, and Hmong, all BSD staff were provided training on research procedures in a two-day workshop, which covered multiple practice sessions, ethics protocols, issues of multilingual translation, security and confidentiality concerns, and instrument protection.

Regarding on-site research permissions and ethics protocols, each research team hosted at least one village-wide meeting to explain the purpose of the survey, to encourage villagers to ask questions and voice concerns, and to ensure that villagers understood their rights to not participate. Prior to initiating each survey, respondents were informed again of their rights to refuse to answer any question, or to withdraw from the survey at any time. To signify consent, villagers provided a fingerprint, followed by that of the surveyor, which is common practice in the region.

In partnership with village leaders, survey staff determined appropriate schedules for household interviews, as timing of residence and availability vary across and within families and communities by farming season and primary livelihood. Some village surveys were therefore completed over the course of several days in a single visit, whereas in other communities, staff interviewed households over the course of several visits. Regardless of timing, the vast majority of interviews were undertaken in the evening, after the workday had ended. Because village electrification was highly varied, interviews were done by candlelight in more than 30 villages (approximately 5,000 households). UNESCO and BSD officers monitored enumerators in the field in each province, provided support, and checked instruments regularly to ensure data accuracy. On the basis of common requests for clarification, a second handbook was developed for on-site data verification to be implemented prior to leaving field-sites (see [23] for further information).

Data entry process, data quality and confidentiality

For data entry and data cleaning, Data Entry Program, Microsoft Access, and SPSS were used. All data entry processes were closely supervised and directed by lead researchers and statisticians. To undertake data entry and coding, 20 workstations were assigned at ABAC Poll, and three stations were used for data verification. To ensure data security, only trained, authorized staff with verified passcodes could access the office and workstations. After all data were entered and checked, the data were de-identified and survey instruments were shredded. Currently, data are stored in Excel, SPSS, SASS, STATA, and R formats in a cloud that is accessible to authorized persons via multiple authentication.

Measuring inequalities in the highland context

The HPS II constitutes a more refined instrument than the HPS I for measuring health access and outcomes, as well as for assessing these outcomes in relation to legal status and household wealth. Therefore, we limit the following description of measures and definitions to the HPS II. When available, we note comparative possibilities with the HPS I. Although the following overview does not constitute a complete review of all variables generated in the HPS II, we outline in detail those variables pertinent to health outcomes and health care access, as well as the complex, interrelated factors that are driving inequalities within and between highlander communities.

Health care access and availability

HPS health measures focused on aspects of healthcare availability, access, use, and attitudes that could be reliably measured in a population-based survey of its size and scope. Of particular interest was how well the Thai government's rural primary health care delivery system reached highland villages and the extent to which access or use varied by province, ethnic group, and legal status. Thus, questions focused on relative access to, and quality of, local primary healthcare at the village and household level based on the existing rural public health care infrastructure. At the time of the HPS II data collection, rural villages were expected to have road access to a nearby sub-district health center staffed with a trained health practitioner (doctor or nurse). Health practitioners based at sub-district health centers--later converted to Subdistrict Health Promoting Hospitals--typically trained village health volunteers (VHVs) from each registered village in community-based preventive health care, e.g., regular at-home visits, diabetes and hypertension screenings, and education on disease prevention [23-24]. cover more background on the historical development of Thailand's rural primary health care system, yet the HPS remains the only

²The Royal Thai Government only began to formalize policy toward highlanders in 1959 with the formation of the Hill Tribe Committee; however, it was not until the establishment of the Tribal Research Center (later, Institute) in 1964 that there was a Thai institution dedicated to research in the highlands (11). The Hill Tribe Committee became the Hill Tribe Development and Welfare Programme of the Department of Public Welfare, which, after many years, was amalgamated with other welfare programs as the Bureau of Social Development and Human Security (BSD) under the Department of Social Development and Welfare of the Ministry of Social Development and Human Security.

survey to extensively measure coverage in the border highland region of northern and northwestern Thailand.

Questions focused on accessibility of primary healthcare services included multiple measures of availability of care through a local VHV and distance to the nearest health care center, as reported by the village representative: (1) health care center in village; (2) time in minutes by motorcycle to nearest health care center; (3) presence of trained VHV; and (4) village road accessibility during rainy season. Among villages with a health care center and/or VHV, village representatives also reported whether each provided the following health services: vaccines, pre and postnatal care, family planning information and birth control, treatment for diarrhea, medicine distribution, and HIV/AIDS information. Additional questions were included to measure use of health services at different public health care facilities: (1) In the past year, when a family member was sick, they sought treatment at a government health clinic (yes/no); and (2) In the past year, when a family member was sick, they sought treatment at a government district hospital (yes/no). Finally, attitudes and concerns related to health care services and medical treatment were also measured, including eligibility for health care insurance coverage. Household representatives were asked about their greatest concern or worry when seeking medical treatment. Possible responses included: (1) Worried about high payment costs or time; (2) Do not have health insurance; and (3) Worried cannot communicate with staff. Finally, medical debt, an additional indicator of health service barriers and potential deterrence from obtaining continued services, was measured separately in the household module in relation to debt and household wealth. Ethnographic research, which informed the construction of both HPS I and II, indicated that families of mixed or no legal status can incur sizable debt to pay for medical bills (Ahlquist, fieldnotes). Jointly with legal status and the other social and structural determinants highlighted above, these measures cover multiple steps widely recognized as critical for delivering quality health care and eliminating related inequities, including service access, insurance coverage, and informed choice among patients [24].

Ethnicity

Ethnicity in mainland Southeast Asia, particularly in the highlands, is both dynamic and complex. It has been shown to be categorical, contextual, and even situational (e.g. [25-28]). This fluidity -- and the frequent conflation of ethnic categories with categories of nationality -- pose a key challenge for studying legal status in the highlands, as highlanders understand that national belonging is tied to claims to the ethnocentric Thai state. In pilot testing the survey, upwards of 5% of respondents in each ethnic subgroup asserted that they were Thai when asked. Conceptions of ethnic

categories (ethnicity) -- as understood by highlanders, as well as by the Thai State at any point in time -- are foundational for understanding all dynamics in the highlands and the structures of highland-lowland relations, and are vital in regard to health outcomes.

Given the challenges of reliably measuring ethnicity in the highland context, the HPS II incorporates a number of variables from which an ethnicity index was constructed. First and foremost, respondents could independently report each family member's ethnicity in the household roster, and these data could be checked against household level variables of 'primary language spoken at home,' 'secondary language spoken at home,' and similar variables at the village level. The overlap between these categories is nearly 1:1 for every ethnic group and could be reconciled by cleaning and cross-checking missing data. However, H'tin, Mlabri, Tongsu, Burmese, and Mon categories varied considerably by individual reporting and language spoken at home. Nearly twice the number of Burmese and Mon people live in households where their language is not spoken than those that do (analysis not shown). Inversely, far fewer people identify as H'tin, Mlabri and Tongsu than those who speak it as a primary language. After reconciling missing data across these subgroups and variables, Figure 1 represents the ethnic distribution of the HPS II. Because of the extraordinary diversity of the sample, only Lahu, Karen, Akha, Hmong, Lisu, and Mien groups are included in the analyses of ethnicity and health outcomes that follow. Ethnic Thais who reside in the highlands are also included to provide a useful comparison group against which highlanders are compared.

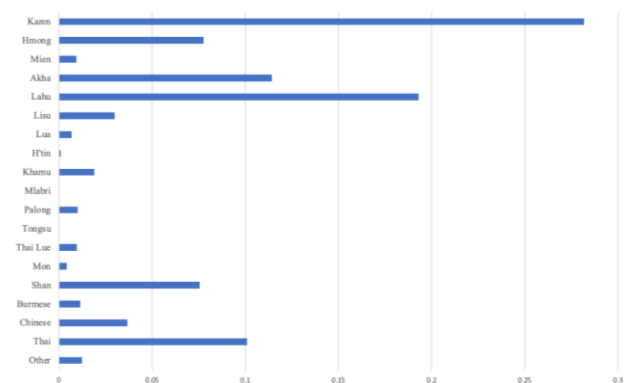


Figure 1 Ethnic distribution of UNESCO HPS II sample

Legal status

Over the past thirty years, legal status has become a critically important and complicated issue for highlanders. Over the course of the early 20th century, as the Thai state increasingly registered its lowland populations, highlanders were variously excluded from this process, often despite documented residence in the

country for centuries [11, 13, 17, 18, 29-32]. Without citizenship, highlanders are considered ‘aliens,’ (*khon dtangtao*), and are regularly denied the basic rights and protections afforded to Thai citizens; And, as a consequence, they are especially vulnerable to socio-economic insecurity, exploitation, and deprivations in access to health, education, and other public services.

A growing literature is examining how legal status is shaping health outcomes in diverse contexts around the world. However, most of this literature derives from research among immigrant communities, and particularly those residing in the Global North. Yet, as the case of highlanders in Thailand reveals, states can deprive non-immigrant populations of recognition of citizenship as well. Indeed, egregious cases of deprivation of status and denationalization among non-immigrant communities persist globally [33], yet the very reasons for these dispossessions (e.g., ethnic and religious discrimination, resource grabbing, etc.) constitute barriers to conducting surveys of affected groups in safe and ethical ways. In other words, states that ‘erase’ populations by refusing to recognize their status and/or residence are often unwilling to permit large population surveys that make legible both the erased population and the reasons for their dispossession. Indeed, the first major Thai national census in 1956 did not even include highland areas [13]. Concerned with security, Thai state conducted several (often incomplete and inaccurate) censuses of highlanders between 1969 and 1999, with the express purpose of registering them as non-citizen ‘aliens’, thus refusing recognition of their claims to citizenship. And yet as a part of this politics of exclusion, the Thai state never conducted systematic surveys of the highland population that could reveal why and how statelessness persisted among highlanders. While there was certainly recognition of the complexity of the legal status of highland people before the start of the millennium, it was not until the UNESCO HPS I was initiated in 2005 that there was a systematic attempt to measure the scale, extent, and impact of the problem.

In addition to barriers to conducting studies of legal status among marginalized populations, legal status itself is a highly complex and dynamic phenomenon, making it extremely difficult to measure. To produce a survey instrument that can reliably measure legal status, a robust assessment of nationality laws and bureaucratic procedures for adjudicating status is required, as is a thorough analysis of how communities understand laws and navigate these procedures. In the Thai context, the Thai ID card (*baht bprachaachon*) should be issued to every citizen at the age of 15 and to all persons over 15 who naturalize. Citizenship is predicated on 1) biological birth to at least one parent with Thai citizenship; and/or 2) proven birth on Thai soil before February 26, 1992; and/or 3) registered residence (at least 10 years) in a registered household in Thailand. Marriage and adoption are also

pathways for naturalization with varied and changing requirements. Denationalization in Thailand is extremely rare, but has occurred in the highland context when people are accused of ‘cheating’ to receive recognition [31]. Therefore, citizen status at any given moment cannot be assumed as indefinitely fixed.

Non-citizen status in the highlands of Thailand is extremely complex as well. From the 1960s forward, the state issued more than 20 different non-citizen IDs, which have been of various size, color, and material. Each ID ostensibly references a particular category of non-citizen (e.g. “refugee,” “alien,” “migrant worker”) to whom particular rights and restrictions apply. The “hill tribe” coin and IDs confer non-citizen resident status to Lua, Karen, Lahu, Hmong, Akha, Khamu, Lisu, and H’tin people, with particular rights to apply for nationality. Yet, because the Thai state never fully understood or accessed highlander communities, and because highlander communities often misunderstood and distrusted state registration processes [29], it is not unusual for highlanders to be in possession of multiple ID cards, and for permanent residents to be registered as migrant workers. Therefore, non-citizen IDs should not be conflated with an essential ineligibility for Thai citizenship. Rather, these IDs reference the state’s varied, flawed, and incomplete attempts to assert knowledge of and power over highlanders. At the same time, they operate in a ‘real’ political economy of access and restriction, and therefore serve as a reliable index of what rights and privileges non-citizen ID holders and their children can and cannot claim at any given moment.

In addition to considering, one’s status at the moment of the survey, the HPS II accounts for household composition^{3/}, biological parentage, and birth registration status, as these factors directly inform one’s eligibility for citizenship. The HPS II also accounts for ancillary factors related to citizenship status, such as application history, challenges to citizenship applications, DNA testing, and educational attainment. Ultimately, as previous analysis of the HPS II has shown [17], 23% of individuals over 15 who lacked a Thai ID card at the time of the HPS II were nevertheless Thai citizens by law according to residence, birth, and/or parentage. Moreover, when awaiting resolution to their applications, both stateless and citizen highlanders had been subjected to wait times that far exceeded those designated in government policy.

In sum, while ID card possession is an imperfect indicator of one’s claims to a particular legal status, it nonetheless provides a reliable index of how its possessor experiences their assigned legal status in everyday life. Therefore, in the broad analyses of health outcomes that follow, those who are non-citizens (0) were compared against citizens (1). Individuals coded as citizens were confirmed as being

in possession of a citizen ID card, whereas those coded as non-citizens refer to people either in possession of a form of “alien” documentation or with no identification whatsoever.

Household wealth

Highlanders are widely regarded by Thais and foreign development organizations as universally impoverished. However, significant wealth disparities exist both between and within highland communities [34,16], and can inform health disparities in a variety of ways. Measuring wealth in highland communities is challenging, in part because conventional measures of wealth, such as salaries and land ownership, are of little use, as incomes tend to be generated through agriculture, informal wage labor, and irregular remittances. Furthermore, while de facto systems of land tenure operate within communities, and while access to land is often highly unequal, the state’s ongoing refusal to grant legal land title to highlanders complicates questions around land ownership and access [35-37]^{4/}. As such, the HPS sought to assess wealth disparities through a portfolio of assets, including, but not limited to, house/roof material, debt, land access, remittances, household assets (e.g. motorbikes, computers, mobile phones), and agriculture-related assets (e.g. livestock, farming equipment). The draft portfolio of assets was initially generated by drawing on the Demographic Health Surveys (<https://dhsprogram.com/>), which are conducted in agrarian communities around the world. The portfolio of assets was then tested, edited, and elaborated in the highland context through months of ethnographic engagement in highland communities.

³Household: In 2006, households were listed, and rosters generated according to the definition used by the Ministry of Interior in its household registration system (TR14/TR13). The household, in this case, consists of a place where more than 2 people, who might be children/relatives, who have a blood relationship together or people who are husband and wife according to legal and practical definition, live together (Translated from interview with Jirayut Banyajai, 2010). This definition was used to generate a household roster in UNESCO HPS I (2006) and in 2010, every willing and available household was selected for re-interview in Chiang Mai, Chiang Rai and Mae Hong Son.

For the second wave of the UNESCO Highland Peoples’ Survey, a wider definition of the household was delineated for the purposes of examining disjunctures and inequities in legal status adjudication and statelessness eradication. This definition is as follows: 1) Every person who has lived in this house for longer than 1 month in the past 5 years (since 2005) including now-deceased persons; 2) Every person listed in the household registration or household survey document regardless of usual place of residence (see 2006 definition); and, 3) Children of head of household or interviewee who are younger than 18 years of age regardless of usual place of residence.

⁴In recent years, the state has taken some tentative overtures toward assigning community land rights to highland communities, though to date no such program has been implemented. As of August 2021, the state continues to dangle the possibility of community land title for at least some highland communities, though it remains unclear whether or to what extent a community land title policy might be implemented. See [36] for a discussion of community land titling in the highlands.

The wealth variable deployed in this paper derives from a principal components analysis (PCA), which identifies several base variables that reliably predict possession of 48 household and farming assets. PCA reveals that, at the time of the survey, possession and number of household assets could be predicted accurately by: 1) the roof material of the home, whether thatch, metal, or tile, and 2) possession of a satellite dish or lack thereof. The wealth index generated through PCA revealed wealth inequalities clustering in quartiles, with the poorest living predominantly under roofs made of thatch—materials that cannot safely accommodate the operation of electronics. The wealthiest villagers have tile roofs, which can accommodate electronics and a satellite dish, luxury items that signify access to discretionary funds (see 16 for details).

Geographical variation

Theoretically, universal health care in Thailand is equally available to all, regardless of place of residence. However, access in Thailand can vary by geographical distance between a place of residence and a local health center, district hospital, and provincial hospital. In the case of the highlands, village administrative structure can advantage or disadvantage residents. For example, “central” villages (muubaa lak) are more likely to have schools and local health centers than their “satellite” villages (muubaa boriwan). Distance in travel times varies between villages, and can be affected by seasonal weather variation, as those villages located along unpaved roads or even paved roads affected by flooding can become impassable during the rainy season. Finally, even when certain facilities are accessible, the availability of services within facilities can vary considerably. With these factors in mind, analyses of health care access and health outcomes in the highlands must not only consider individual factors of legal status, ethnicity, and household wealth, but also geographical access to and availability of services.

Results

In the brief analyses that follow, we examine a range of health care access and availability outcomes according to legal status, ethnicity, household wealth, and geographical location. We initiate the results section with legal status as it is directly tied to health benefits and eligibility. Descriptive data provided herein trace a general baseline of inequalities in health care in the highland context and signal several ways that these inequalities are likely accruing to citizens, relatively privileged ethnic groups, wealthier households, and communities that are located proximal to health facilities that offer a range of care services.

Legal status

While only 74% of individual household respondents held Thai ID cards at the time of the survey, legal status issues are more pervasive at the household level. Sixty-three percent of households are comprised entirely of Thai citizens, whereas 16% are households of mixed status, and another 21% are households in which all members lack citizenship. Crosstabs and chi-square analyses that follow indicate significant inequalities in household legal status and those of health care access outcomes.

Table 1 focuses on barriers to health care by legal status of household members. The first section indicates respondents' greatest concerns about seeking health care services. A significantly higher percentage of non-citizen households (40.8%) rated lack of health insurance as their greatest concern than did households where all members possessed citizenship (4.3%), with mixed-status households (16.7%) falling in-between. Citizen (65.8%), non-citizen (44.8%), and mixed-status (58.9%) households all indicated cost – including both time and money – as their greatest concern. “Costs,” in this case, may include not only the cost of healthcare services, which are higher for the uninsured, but also the costs of transportation, medications, etc. Importantly, measuring concern about cost does not necessarily equate with actual costs.

Table 1. Barriers to health care by legal status of household members

	Citizen	Stateless	Mixed	Chi2
Greatest concern when seeking health care	n=7,439	n=2,666	n=1,965	2.2e***
No health care insurance	4.3%	40.8%	16.2%	
Cost; Financial and Time	65.8%	44.8%	58.9%	
Communication concern	11.0%	6.7%	9.3%	
Fear of arrest	1.3%	1.8%	0.9%	
Fear of discrimination	3.4%	1.4%	2.4%	
In past year when family member was ill, they sought care at:	n=9,552	n=3,106	n=3,106	
Private clinic or Hospital	16.7%	7.9%	12.5%	155.39***
Provincial Hospital	6.7%	11.2%	16.0%	55.21**
District Hospital	83.6%	69.9%	80.1%	276.91***
Local clinic (Public)	79.2%	82.3%	82.3%	27.29***
Household has medical debt	n=5,221	n=763	n=1,128	16.89***
	61%	87%	8.9%	

The second section of Table 1 elaborates on inequalities in access to healthcare services. While all households were able to access local public clinics at similarly high rates (roughly 80% across all legal statuses), citizen households were accessing facilities with a wide range of health care services --district hospitals (83.6%), provincial hospitals (16.7%), and private clinics (16.7%)--at greater rates than were stateless households (69.9%, 11.2%, and 7.9%, respectively). As would be expected, mixed-status households fell in-between. The final section of Table 1 shows that more non-citizen (8.7%) and mixed-status (8.9%) households carry medical debt than do citizen households (6.1%). Note that only households with outstanding loans responded to this question, so the

number of respondents, especially among non-citizen respondents for whom credit is difficult to obtain (37), is far smaller than for the prior questions.

Ethnicity

HPS II data point to significant variations in health care experiences and access by ethnicity. Again, an intensive analysis of each group's particular experiences lies beyond the purview of this article, but drawing from Table 2, it is critical to point out that ethnic Thais enjoy lower medical debt and greater access to robust health facilities than do members of all highlander groups. Specifically, ethnic Thai households residing in highland border villages reported higher rates of access to private clinics and hospitals (28.8%) and provincial hospitals (22.9%) than did members of all highlander groups for whom access to private facilities ranged from 7%-26% and to provincial hospitals from 6% to 25%.

It's important to consider how ethnicity is associated with accessibility factors, not only at the household-level, but at the village level as well. As Table 3 indicates, village health care center availability and service provision vary considerably by village's predominant ethnic group, yet availability of VHCC never exceeded 35% for any one group. For example, 33.6% of predominantly Karen villages had a functional health care center, yet only 19.4% of these facilities offered all basic services. These proportions are similar for highland villages that are predominantly Thai (25.0% and 18.8%, respectively), Hmong (35% and 10% respectively), and Akha (24.1% and 3.4%, respectively), but were significantly lower for villages with predominantly people of Lahu ethnicity. Only two of 52 villages that were predominantly Lahu had health care centers, both of which offered all basic services. Ninety-three and ninety percent of villages of predominantly Akha and Lahu people, respectively, had village health volunteers (VHV). Yet, only 3.4% and 2.0%, respectively, had VHV trained in all basic services. Thai and Karen villages had a higher percentage of villages with village health volunteers who offer all basic services (50% and 27.2% respectively). In sum, data point to wide variation in health care access and availability by ethnicity, and suggest that significant needs persist in health care provision at the local level for all communities across the highlands.

Household wealth

Section 1 of Table 4 focuses on perceived barriers to accessing health care services by household wealth status. When it comes to households' greatest concerns when seeking health care services, 20.8% of the poorest quartile reported 'lack of health insurance' as their greatest concern, compared with only 11.3% of households in the wealthiest quartile. Across all wealth quartiles, the cost of care registered as the greatest

Table 2 Barriers to Health Access by Ethnicity

	Lahu	Karen	Akha	Hmong	Lisu	Mien	Thai	Chi2
Greatest concern when seeking health care	n=2,583	n=3,077	n=1,299	n=647	n=378	n=92	n=1,296	<i>1.8e+3***</i>
No health care insurance	10.6%	14.2%	14.6%	2.9%	34.4%	9.8%	4.2%	
Cost; Financial and Time	62.7%	55.9%	52.2%	79.9%	46.6%	82.6%	60.8%	
Communication concern	15.4%	11.9%	12.3%	4.2%	13.2%	2.2%	1.5%	
Fear of arrest	0.8%	0.9%	2.6%	2.5%	0.5%	0.0%	1.9%	
Fear of discrimination	2.8%	2.9%	3.9%	2.2%	0.5%	0.0%	2.2%	
In past year when family member was ill, they sought care at:	n=2,842	n=4,410	n=1,383	n=817	n=400	n=108	n=1,939	
Private clinic or Hospital	11.4%	7.1%	20.8%	11.9%	8.3%	26.9%	28.8%	<i>1.2e+3***</i>
Provincial Hospital	6.3%	13.4%	15.7%	25.8%	10.8%	12.9%	22.9%	<i>726.19***</i>
District Hospital	84.7%	73.9%	87.2%	88.3%	81.0%	87.9%	85.3%	<i>497.07***</i>
Local clinic (Public)	86.0%	76.2%	86.2%	82.7%	92.3%	87.0%	75.8%	<i>96.78***</i>
Household has medical debt	n=1,442	n=1,942	n=599	n=536	n=103	n=72	n=1,204	
	8.0%	4.5%	10.2%	5.2%	7.8%	13.9%	4.1%	<i>153.78***</i>

Table 3 Health care availability and access by primary ethnic group in village

	Lahu	Karen	Akha	Hmong	Lisu	Mien	Thai
No. Village Surveyed	129	20	2	29	52	5	32
% Accessible During Rainy Season	81.4%	90.0%	0.0%	92.3%	79.1%	50.0%	100.0%
Village has Health Volunteers	89.8%	100.0%	100.0%	93.1%	90.2%	80.0%	100.0%
If yes VHV: % Trained in All Basic Services	27.2%	26.3%	0.0%	3.4%	2.0%	0.0%	50.0%
Village has Health Care Center	33.6%	35.0%	0.0%	24.1%	3.9%	40.0%	25.0%
If VHCC: % Offering in All Basic Services	19.4%	10.0%	0.0%	3.4%	3.8%	0.0%	18.8%
If no HVCC: Ave minutes by motorcycle to closest VHCC	33	20	45	27	38	22	17
	49.3	11.7	21.2	18.1	29.4	7.6	17.5

Note: Members of Shan/Thai Yai, Chinese, Khamu, Burmese, Thai Lue, Lua, H'tin, and Palong groups also resided in villages represented in this analysis. 2.4 In order to be included as offering all basic services, the individual interviewed for the village surveyed had to confirm that the village health center or Village Health Volunteer provided all of the following services: (1) vaccines, (2) pre and post-natal care, (3) family planning (birth control), (4) treatment for diarrhea, (5) distribution of medicine, and (6) HIV/AIDS information. 3.5 Village Health Volunteers (appointed by district or provincial hospitals).

Table 4 Barriers to health care by wealth status of household

	Poorest	Q2	Q3	Wealthiest	Chi2
Greatest concern when seeking health care	n=3,461	n=2,789	n=3,253	n=3,253	<i>328.57***</i>
No health care insurance	20.8%	13.9%	10.2%	11.3%	
Cost; Financial and Time	56.0%	58.0%	65.4%	61.5%	
Communication concern	11.8%	9.1%	9.4%	8.4%	
Fear of arrest	1.7%	1.9%	0.6%	1.3%	
Fear of discrimination	2.3%	3.1%	3.3%	2.8%	
In past year when family member was ill, they sought care at:	n=4,112	n=3,696	n=4,036	n=3,164	
Private clinic or Hospital	18.9%	16.3%	34.2%	30.6%	<i>291.9***</i>
Provincial Hospital	17.6%	18.6%	38.9%	24.9%	<i>303.9***</i>
District Hospital	25.3%	24.3%	27.5%	21.1%	<i>112.9***</i>
Local clinic (Public)	27.4%	24.6%	26.9%	20.6%	<i>96.78***</i>
Household has medical debt	n=1,688	n=1,556	n=2,109	n=1,749	
	8.5%	6.5%	5.6%	6.7%	<i>13.12***</i>

Table 5 Village-level access to health care by province

	Chiang Rai	Chaing Mai	Mae Hong Son	Tak	Kanchanaburi
No. Village Surveyed	n=65	n=63	n=57	n=89	n=31
% Accessible During Rainy Season	93.0%	87.3%	76.9%	80.7%	100%
Village has Health Volunteers	98.5%	87.1%	83.9%	87.6%	100%
If yes VHV: % Trained in All Basic Services	12.5%	11.7%	14.3%	35.6%	17.9%
Village has Health Care Center	24.6%	9.7%	24.6%	34.1%	45.2%
If VHCC: % Offering in All Basic Services	7.7%	4.8%	10.5%	21.3%	22.6%
If no HVCC: Ave minutes by motorcycle to closest VHCC	33	20	45	27	38
	<i>49.3 std</i>	<i>11.7 std</i>	<i>21.2 std</i>	<i>18.1 std</i>	<i>29.4 std</i>

concern. Combining the responses “no health insurance” and “cost: time and money” as cost-related concerns, over 70% of households across all wealth quartiles registered the cost of seeking health care services as their greatest concern.

Section 2 of Table 4 shows that households in the wealthier quartiles were more likely than households in the poorer quartiles to seek health care at private clinics and provincial hospitals. Interestingly, households in the third quartile were the most likely to seek care at private clinics (34.2%), and by far the most

likely to seek care at provincial hospitals (38.9%). By comparison, 30.6% of households in the wealthiest quartile sought care at private clinics and 24.9% sought care at provincial hospitals. Among households in the poorest quartile, 18.9% sought care at private clinics, while 17.6% sought care at provincial hospitals. Finally, the poorest quartile of households (8.5%) carried more debt due to healthcare-related expenses than all other quartiles, and the third quartile (5.6%) carried the least healthcare-related debt.

Geography

Table 4 shows the availability and accessibility of village health volunteer services across all surveyed villages. Overall, the proportion of villages with health care centers (VHCC) was low for each province, with Kanchanaburi reporting the highest proportion (45.2% with VHCC) and Chiang Mai reporting the lowest (9.7% with VHCC). However, many of these health care centers provide only minimal services. When considering health care centers that provide all basic services, the proportion of villages does not exceed 22.6% (Kanchanaburi), with only 4.8% in Chiang Mai with comprehensive health services.

Accessibility is another factor in health care access. While Kanchanaburi has the highest proportion of villages with health care centers, the average distance from surveyed villages to a health care center by motorcycle is the longest (50 minutes), while the shortest average distance by motorcycle was in Chiang Mai (22 minutes). Most villages had roads accessible during the rainy season, although only 76.9% and 80% of the villages in Mae Hong Son and Tak provinces, respectively, had accessible roads during the rainy season. In this particular border zone, roads to and from some villages can become entirely inundated and rendered impassable for weeks at a time.

Village health volunteers (VHV) are a cornerstone of universal health care in Thailand [23]. The proportion of surveyed villages with VHVs was high - over 90% overall - with Tak province having the lowest percentage of villages with VHV (83.9%). However, the proportion of villages with VHV offering all basic services was only 20% overall, including only 11.7% and 12.5% in Chiang Mai and Chiang Rai provinces respectively.

Finally, general household-level data by province are also critical in understanding barriers to healthcare in the highlands of Thailand. Of the 15,552 households surveyed, 12,552 (80.3%) sought treatment for a family member in a government health clinic, with the lowest percentage in Kanchanaburi (70.4%) and Tak (73.0%) provinces. There was a similar trend with respect to seeking treatment at a government hospital, with households located in Mae Hong Son (70.6%) and Kanchanaburi (66.7%) reporting the lowest usage. Almost sixty percent of the households overall stated that their greatest concern when seeking medical treatment was high payment costs or time, with all provinces reporting over 60%, with the exception of Tak province (23.8% of households). A similar percentage of households in Tak province reported that their greatest concern/worry when seeking medical treatment was lack of health insurance (23.8% of households), but in this case, households in other provinces reported much lower worry of lack of health insurance (8.1% in Mae Hong Son province to 19.7% in Chiang Rai province). Only 9.8% of the households reported that their greatest concern/worry was

communication with staff. However, due to how this question was asked, it is important to consider how this does not mean that communication was not a highly prevalent concern. Communication was simply not considered as the greatest concern among many also facing financial concerns.

Discussion

Findings from this analysis of UNESCO HPS II data on inequalities in health care access and availability in the highlands affirm and extend conclusions from ethnographic research and smaller-scale surveys: despite Thailand's laudable push for universal health care and claims of universal reach, significant barriers to universal health care access and availability persist in highlander communities. The unprecedented scope of the study --across village borders and lines of ethnicity and legal status-- reveals novel and necessary findings as well. All highlanders are experiencing relatively low health care outcomes compared to ethnic Thais -- even ethnic Thais similarly situated, and significant inequalities in health care outcomes exist among and between highlanders that persist along the lines of ethnicity, legal status, and geographical distance/proximity.

With regard to ethnicity, a rigorous analysis on inequities in access between groups lies beyond the scope of this article. However, the scope of data in the HPS II sample of border villages provides incontrovertible evidence that ethnicity remains a salient factor in shaping life outcomes in the highlands. Future health research that includes highlanders in population samples, therefore, should account for ethnicity in examining outcomes among and between highlander villages and groups.

Additionally, and significantly, findings from the HPS II show that Thai ethnicity is a salient, non-neutral factor in shaping health outcomes as well. While ethnic Thai households may have reduced access to services due to their location in highland areas, these households nevertheless enjoy greater access to a range of health care services than do Hmong, Mien, Akha, Lahu, and Lisu households. Predominantly ethnic Thai villages are more likely than villages comprising primarily highlanders to have village clinics and trained health volunteers.

Findings from this analysis are not accompanied by extensive ethnographic or interview data explaining why statistical differences along ethnic lines exist. Therefore, it is critical to not conflate 'highland ethnicity' with 'barrier.' Such oversimplifications are misinformed and tragically common. They often result in policy interventions, even ones promoting ostensibly universal access, that ultimately exacerbate existing forms of structural marginalization among already vulnerable communities [5, 38, 39]. Differences in health care utilization between highland ethnic groups signal potential policy failures to make health care

accessible in multiple languages and culturally sensitive to particular health care beliefs and practices. This disproportionately affects non-Thai communities, particularly at health facilities at and within district boundaries.

As is often the case in contexts of protracted legal exclusion and statelessness around the world, legal status is tightly coupled with ethnicity, religion, race, and other supposed markers of national difference. In the case of Thailand, highlanders were variously excluded from citizenship for a range of reasons, including but not limited to general neglect and systemic discrimination. Although the state has been working to adjudicate citizenship and prevent statelessness in the highlands over the past two decades [11, 17, 18, 32], significant barriers to citizenship persist, and as findings from this analysis demonstrate, lack of Thai citizenship is significantly associated with reduced outcomes in health care access.

As one example of the relationship between legal status and health care, non-citizen households are overwhelmingly more likely than citizen households to view a lack of health insurance as a barrier to accessing healthcare services--a finding that is unsurprising given that many non-citizens did not yet qualify for Thailand's universal coverage scheme at the beginning of 2010, when the HPS II data collection started. And, subsequent to the policy change extending coverage eligibility to stateless individuals--which came into effect later in 2010--barriers to health care likely still persist due to limited information availability, uneven access to government offices, eligibility being tied to stable residence, and other general lags in enrollment. While households across all legal status categories registered concerns about the costs associated with seeking health care, it is likely that stateless households have faced higher costs – both real (e.g. paying for healthcare without insurance) and relative (e.g. costs of care relative to household income) – associated with seeking health care services than do their citizen counterparts. Additionally, the HPS data show that relatively few non-citizen households reported fear of communication barriers (fear of arrest and discrimination are their greatest concerns); however, ethnographic research finds that these are significant concerns for many highlanders, especially those without citizenship, and that these concerns are amplified in cases where stateless people must travel beyond their home district [11, 16-18, 40, 41].

The HPS II found that in 2010 citizen households were far more likely than non-citizen households to seek care beyond their local clinic, at district and provincial hospitals, and private clinics which were typically farther away. Ethnographic observation suggests that concerns around and barriers to seeking health care are amplified for stateless households in cases where they must travel beyond their home district [11, 17]. For example, stateless people must gain

written permission from government officials to travel across internal borders, even for health care emergencies, a process that can be time consuming and unpredictable, and rife with possibilities for extortion by local officials. Traveling across borders without such permissions means risking arrest and even deportation [18, 17, 29]. What's more, the direct and indirect costs of care at district and provincial hospitals and private clinics can be far higher than at local health clinics. Even in cases where they are granted permission to travel, non-citizen still face significant barriers to accessing healthcare services at these facilities, including restrictions on services covered by public insurance.

Ethnographic observations in highland communities indicate that citizen and non-citizen households take on and carry debt in different ways because citizen households have greater access to credit, such as bank loans and government credit programs [35]. The HPS data show that non-citizen households with debt are more likely than citizens with debt to carry healthcare-related debt in particular. Importantly, ethnographic observation suggests that the HPS data may underestimate the healthcare-related debt burden of non-citizen households. Because they have less access to formal credit than do citizen households, non-citizen households often carry informal debts, such as loans from friends or relatives, and they may repay debts in non-monetary ways, such as through agricultural labor [35]. In other words, when direct and indirect healthcare-related expenses arise, non-citizen households may secure the needed funds through means other than formal loans.

When it comes to households' concerns about seeking healthcare services, legal status and wealth intersect, as households in the poorest quartile are far more likely than households in the wealthiest quartiles to be non-citizens [16]. As such, households in the poorest quartile were far more likely than households in the wealthier quartiles to report a lack of health insurance as their greatest concern when seeking healthcare services, and to carry debt for healthcare-related expenses. The intersection between legal status and wealth status also likely informs the disparity between the poorest quartile and the wealthier quartiles in terms of accessing healthcare services at district and provincial hospitals and private clinics. Although public health care insurance was extended to stateless individuals in Thailand amid the deployment of the HPS II, lack of awareness of eligibility, poor access to enrollment services, and lagged enrollment likely continue to contribute to ongoing worries over insurance coverage. Combined with restricted mobility and limited household resources, these barriers still contribute to the high burden of unmet care among non-citizen households.

Strengths and Limitations of the HPS Data

As noted above, the UNESCO HPS instruments were part of a larger, sequentially-designed mixed-methods research agenda that was informed by ethnographic accounts of social and cultural change in highlander communities. Therefore, UNESCO HPS data can be triangulated against findings from these studies and other studies in the highlands to provide novel and clear understandings of the extent of health inequities and other phenomena across ethnic and geographic lines. To this end, HPS data, while limited to border communities, are nevertheless generalizable when contextualized within a broader understanding of the dynamic highland context, and compared rigorously against ethnographic information from deeper studies in particular communities.

For instance, a contextual understanding of the highlands--acquired through interviews and extensive site visits--indicates that the picture of relatively low health access and persistent legal status barriers revealed in this analysis likely represents a more favorable picture of highlander health and legal status than would be detected in a randomized sample. While the Thai border has often been described as 'remote,' and 'dangerous,' in Thai and foreign scholarship and media alike, the geography of the border varies similarly to that of the mountainous interior of the country. In a few areas where the survey was conducted (in Mae Hong Son, in particular), road access was extremely limited. Yet, because infrastructure at border villages is key for "performing" the border in an internationally contested region [38], border villages are often more likely to have functioning health clinics and schools than highland villages located further from the border. For research purposes, the baseline data collected in the HPS are most useful when read against the rich bodies of ethnographic research that can contextualize and compare outcomes among particular highlander groups.

Conclusions

The United Nations Sustainable Development Goal 3 calls for universal health care, based on the principle that all individuals and communities should have access to quality, essential health services without suffering financial hardship. Thailand, which claims to provide health coverage to all households through its universal coverage scheme, is often held up as a success story among middle-income countries (see [40]). However, this claim of 100% coverage is not only difficult to evaluate, it is based on census data that do not tabulate ethnicity or citizenship. As the HPS data reveal, this blind spot in Thai census data conceals significant inequities in access to health care along the lines of ethnicity and citizenship, particularly in the northern highlands.

The UNESCO Highland Peoples Survey II offers a critically-needed baseline study of basic health access, availability, and outcomes among the extremely ethnolinguistically diverse population of Indigenous and ethnic minority highlanders in Thailand. In doing so, it comprises an example of how ethnographically-informed survey instruments can better assess health outcomes across a vast and extremely diverse population. As a cross-sectional study of a purposively selected large-scale population, the reliability and validity of HPS data can be measured best in relation to what is known from intensive ethnographic studies and smaller-scale studies. Indeed, the HPS II extends and affirms much of what is known either observationally or via in-depth studies among particular ethnic groups in the highlands. These findings, triangulated with other qualitative and ethnographic methodologies, constitute a testament to the reliability and strength of the HPS overall. The HPS II data, as a cross-sectional survey, cannot independently reveal why certain outcomes of health are indicated without ethnographic and qualitative research, the survey data offer unprecedented opportunities to examine the extent of health inequalities and related phenomena across social and geographical borders of language, legal status, and village location. Ultimately, this general analysis of inequities in health care access reveals that in the case of Thailand, although universal health care provisions have effectively expanded the rural healthcare infrastructure and physical access to facilities, this has not ensured universally met health care needs. Both direct and indirect barriers are undermining goals of universal health care access for highlanders. These include, but are not limited to, concerns regarding communication and discrimination, higher costs and risks associated with travel to distant health facilities (particularly for non-citizens), lower incomes associated with lack of citizenship (which is disproportionately experienced by highlanders), and reduced and lower quality health care services available in highlander villages.

Indigenous and ethnic minority peoples, and people who experience precarious legal status and statelessness disproportionately experience poor health outcomes as well as relatively low access to reliable and appropriate health care services. These facts do not simply warrant more expansive enumeration of understudied groups. Rather, these systemic disadvantages comprise an obligation for public health advocates and researchers to interrogate how, why, and to what extent barriers to health persist for peoples of Indigenous and ethnic minority backgrounds as well as for those who lack citizenship in their home of residence. Doing so, however, requires a systemic shift in health focus: when pursuing universal health care coverage, studies and evaluations of these programs must use multiple, particular (non-universal) methodologies in accounting for the unique

experiences of special populations. The HPS data shows why the omission from censuses of stateless, Indigenous, and ethnic minority peoples matters for those populations when it comes to characterizing access to healthcare services in the entire population of a country or region, and the critical importance of gathering ethnically disaggregated data. The study and its findings illustrate the ongoing need for pairing survey data with ethnographic research to design strategies that address the complex and heterogeneous reasons these populations experience barriers to essential healthcare services.

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Effectiveness of a Diabetes Mellitus and Hypertension-Reducing Intervention Program among Akha Adults in Northern Thailand

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ABSTRACT

Background: Noncommunicable diseases (NCDs) are a major global challenge, especially for those with poor socioeconomic status. Akha is one of the hill tribes living lower than the national poverty line in northern Thailand that is facing problems with NCDs. This study aimed to assess the effectiveness of a diabetes (DM) and hypertension (HT)-reducing intervention model. **Method:** A community-based experimental design was used to assess the effectiveness of a diabetes (DM) and hypertension (HT)-reducing intervention model. The experiment was conducted in two villages in Akha. In each village, 30 persons aged 30 years and over were randomly selected as key participants. Specific training programs on DM and HT prevention and control, healthy food preparation, and cooking demonstrations were provided, including the promotion of regular exercise between September and December 2019. A validated questionnaire, physical examination (checking both blood pressure and HbA1c), and lipid profile were used as indicators of the study. A model was developed and used as a key intervention. A chi-square and t-test were used to detect a significance level of $\alpha=0.05$. **Results:** A total of 60 participants were recruited for the study, with 30 in the intervention village and 30 in the control village. Of the participants from the intervention village, 50.0% were female, 43.3% were aged 30–45 years (mean=47.6, SD=9.6), 100.0% were married, 100.0% were Christian, and 90.0% were non-educated, while of the participants from the control village, 50.0% were female, 43.3% were aged 30–45 years (mean= 50.5, SD=10.0), 90.0% were married, 96.7% were Christian, 100.0% were non-educated, and 53.3% were employed daily. The quantity of monosodium glutamate used for cooking (p-value<0.001) and the quantity of cooking oil used during cooking (p-value=0.004) were found to be different between the groups. Comparisons of biomarkers between the control and intervention groups after the intervention showed that triglyceride levels were statistically significant between the groups (p-value=0.048). However, knowledge and attitudes toward DM and HT prevention and care increased. **Conclusion:** The community-based intervention could improve people health especially in reducing lipid levels among Akha hill tribe adults.

Keywords: Diabetes mellitus, Hypertension, Intervention, Hill tribe, Akha, Adults

Introduction

Diabetes mellitus (DM) and hypertension (HT) are major non-communicable diseases (NCDs) [1–3]. The World Health Organization (WHO) reported that 41 million people died each year from NCDs, and among those, 15 million were aged between 30–69 years, which are considered premature deaths [4]. A large proportion of premature deaths (85.0%) have been reported in low- and middle-income countries [4]. NCDs are reported globally and require a large amount of medical expenses for care and treatment [5]. Diabetes mellitus (DM) and hypertension (HT) are the

most common NCDs [6]. It has also been well-established that DM and HT are major contributors in reducing quality of life (QOL) of both patients and their family members [7,8]. With the current conditions of being diagnosed with these two diseases, treatment will be required for patients' entire lives [5]. An unhealthy diet, low physical activity, and substance use were identified as contributing factors to the disease [4]. Several factors that contribute to the development of DM and HT are well-known, including physical and mental health, as well as other socioeconomic dimensions [9]. The impact it has will be especially

pronounced on people with poor education and low socioeconomic status.

The hill tribe are a group of people who have migrated from South China and settled in Northern Thailand for centuries [10]. As a result of globalization, almost all hill tribe people experience several mixed cultures, including different eating behaviors and lifestyles [11]. Apidechkul [12] reported that the prevalence of HT and DM among Akha people were 46.9% and 8.6%, respectively. Unhealthy food consumption and low physical activity were identified as potential causes of DM and HT. Moreover, high quantities of oil and salt were also detected as contributing factors of DM and HT among hill tribe people living in Northern Thailand [12,13]. Therefore, modifying these behaviors and intervening through specific groups to find the proper model to improve some key indications could be advantageous, and should be explored by public health professionals.

This study aimed to assess the effectiveness of the intervention model implemented in two selected Akha villages.

Methodology

A community-based intervention was used to implement a specific intervention program designed to reduce DM and HT among the adult Akha population. The study settings were chosen in two villages located in Muang District, Chiang Rai Province, Thailand; one intervention village (57 households) and one control village (68 households). The two villages are more than 30 km apart.

The intervention program was carefully designed based on prior scientific and medical information. The sample size was calculated according to the standard sample size calculation for comparison between the two groups when the endpoint was quantitative data, and is given as follows:

$$n = 2SD^2 (Z_{\alpha/2} + Z_{\beta})^2 / d^2 \quad [14],$$

where SD is the standard deviation from the previous study, which was 0.2 [15]; $Z_{\alpha/2}$ was a type-I error at 95% confidence interval (CI), which was 5.0%; Z_{β} was 0.84 at 80% power of the test; d was the effect size or the difference between means, which was 0.6 [15], and 27.8 participants were needed in each group. After accounting for any error and loss to follow-up (10.0%), 30 participants were required for the analysis.

Questionnaires were administered and 5 mL blood samples were obtained as the research instruments. The questionnaire consisted of five parts. In part one, 10 blank spaces regarding weight, height, lipid profiles, and HbA1c, among others, were included. In part two, 15 questions were used to collect general information, such as age, sex, education, occupation, and so on. In part three, 10 questions were provided to analyze individuals' behaviors, such as smoking, alcohol use,

and opium use, among others. In part four, 20 questions were used to detect the patients' knowledge related to DM prevention and control. In part five, 20 questions were used to detect the patients' attitudes toward HT prevention and control.

The validity and reliability of the questionnaire were assessed before use. The item-objective congruence (IOC) method was used to assess validity. By doing the IOC, three experts in the field were invited to score each item of the questions. Questions wherein respondents scored less than 0.5 were excluded from the set of the questionnaire, while those scored between 0.5 and above were revised and put into the set of the questionnaire. Afterwards, the questionnaire was administered to 10 selected people who had similar characteristics to the participants. After doing so, the questionnaire was observed for its feasibility, understandability, and order or sequence of the question. Finally, Cronbach's alpha was calculated to determine its reliability for parts four and five, which were found to be 0.77 and 0.71, respectively. Access to the two villages was granted by district government officers. Thirty people aged ≥ 30 years were randomly selected from each village. However, the intervention was implemented in all people living in the intervention village, but only selected people were detected according to the indicators of the study. Those who had a poor disease stage and were also unable to provide information for any reason were excluded from the study.

A total of 30 participants from each village were recruited randomly from the list of people who met the inclusion and exclusion criteria for living in a certain village; 15 participants were selected from males, and another 15 participants were selected among females. In both villages, the selected participants were asked to complete the questionnaire, and 5 mL blood specimens collected before the program were administered to the intervention village. Blood specimens were transferred to the Mae Fah Laung Medical Laboratory Center for analysis.

During the intervention, all people living in the intervention village were invited to participate in the program. In the control village, all the people adhered to their original daily lifestyle until the end of the program, and they were provided the same intervention. The questionnaire was collected from participants living in both villages at the beginning of the intervention. Analysis knowledge and attitudes as well as blood specimen collection was performed twice, during before and after the intervention, on the 60 selected participants in the intervention and control villages. All participants were provided with information and consumed nothing orally 12 h before blood sample collection.

The intervention village in this study was applied from our previous cross-sectional study, which reported that poor physical activities and high lipid

profiles, including a high volume of oil and salt in cooking practices, were associated with DM and HT among hill tribe people [13]. The designed intervention programs were focused on providing knowledge about DM and HT and their prevention and controls three times, including healthy cooking practices, with a 2-week gap between. There were equipment to play several kinds of sports, such as badminton, table tennis, football, takraw, and volleyball. Five people were selected to be the leader of a sport to motivate people to play a sport every day. Specific designed forms for recording participation activities in sports were created and used to collect data. A group aerobic exercise program was developed and implemented in the village. Three demonstrations and contests of healthy cooking practices were demonstrated in the intervention village. During the intervention, three nutritionists were invited to demonstrate healthy food cooking practices for the villagers. Regular checking of body weight and blood pressure were performed by village health volunteers. The intervention lasted three months, between September and December 2019.

The questionnaires were coded into Excel sheets. Before transferring for the analysis, data were checked for missing data and errors. Data were analyzed using R (R 4.00, 2020) for analysis. Descriptive data analysis was performed properly, and categorical data were presented as percentages, while continuous data were presented as means and standard deviations. The chi-square test and t-test were used to detect the different proportions and means between groups at a significance level of $\alpha=0.05$. The pair t-test was used to assess the different means within group, while the independent t-test was used to assess the different means between groups.

All procedures and instruments for the study were approved by the Human Ethics Committee of Mae Fah Laung University (IRB No. REH-61009). Participants were provided with all essential information, including the process of conducting research before obtaining informed consent.

Results

A total of 60 participants were recruited into the study: 30 in the intervention village and 30 in the control village.

Characteristics of the participants from the intervention village: 50.0% were female, 43.3% were aged 30–45 years (mean= 47.6, SD=9.6), 100.0% were married, 100.0% were Christian, 90.0% were non-educated, 56.7% were agriculturalist, 43.3% had family annual income less than 50,000 baht, 66.7% were overweight, 23.3% could not speak Thai, and 6.7% could not understand Thai (Table 1).

Table 1. General characteristics of participants

Characteristics	Intervention n (%)	Control n (%)	χ^2	p-value
Total	30 (100.0)	30 (100.0)	N/A	N/A
Sex				
Male	15 (50.0)	15 (50.0)	0.00	1.000
Female	15 (50.0)	15 (50.0)		
Age (years)				
30–45	13 (43.3)	13 (43.3)	1.36	0.506
46–60	14 (46.6)	11 (36.6)		
> 60	3 (10.1)	6 (20.1)		
<i>Mean = 47.6, S.D. = 9.6, min = 32, max = 66 for intervention Mean = 50.8, S.D. = 10.0, min = 38, max = 68 for control</i>				
Marital status				
Married	30 (100.0)	27 (90.0)	3.15	0.075
Ever married	0 (0.0)	3 (10.0)		
Religion				
Christen	30 (100.0)	29 (96.7)	1.01	0.313
Buddhist	0 (0.0)	1 (3.3)		
Education				
No education	27 (90.0)	30 (100.0)	3.15	0.206
Primary school	2 (6.7)	0 (0.0)		
High School	1 (3.3)	0 (0.0)		
Occupation				
Unemployed	0 (0.0)	10 (33.4)	20.97	0.001*
Agriculturist	17 (56.6)	4 (13.3)		
Trade	2 (6.7)	0 (0.0)		
Daily employed	11 (36.7)	16 (53.3)		
Annual family income (baht)				
≤50,000	13 (43.3)	26 (87.7)	12.38	<0.001*
≥ 50,001-100,000	17 (56.7)	4 (13.3)		
Debt				
No	15 (50.0)	17 (56.7)	0.26	0.604
Yes	15 (50.0)	13 (43.3)		
Number of family member (persons)				
≤4	9 (30.0)	13 (33.3)	1.14	0.284
≥5	21 (70.0)	17 (56.7)		
Living with				
Spouse	28 (93.3)	25 (83.3)	1.45	0.227
Child	2 (6.7)	5 (16.7)		
Body mass index (BMI)				
Underweight (≤18.5)	1 (3.3)	0 (0.0)	1.22	0.541
Normal (18.51–22.99)	9 (30.0)	11 (36.7)		
Overweight (≥23)	20 (66.7)	19 (63.3)		
Checking DM status in previous year				
No	15 (50.0)	14 (46.7)	0.06	0.796
Yes	15 (50.0)	16 (53.3)		
Checking HT status in previous year				
No	13 (43.3)	10 (33.3)	0.63	0.425
Yes	17 (56.7)	20 (66.7)		
DM history of father				
Yes	1 (3.3)	0 (0.0)	1.40	0.495
No	27 (90.0)	29 (96.7)		
Do not know	2 (6.7)	1 (3.3)		
HT history of father				
Yes	1 (3.3)	1 (3.4)	0.35	0.838
No	27 (90.0)	28 (93.3)		
Do not know	2 (6.7)	1 (3.3)		
DM history of mother				
Yes	5 (16.7)	1 (3.4)	3.49	0.174
No	23 (76.6)	28 (93.3)		
Do not know	2 (6.7)	1 (3.3)		
HT history of mother				
Yes	9 (30.0)	1 (3.4)	8.45	0.014*
No	19 (63.3)	28 (93.3)		
Do not know	2 (6.7)	1 (3.3)		
Ability in speaking skill				
No	7 (23.3)	4 (13.3)	5.55	0.062
Few	8 (26.7)	17 (56.7)		
Yes	15 (50.0)	9 (30.0)		
Ability in listening skill				
No	2 (6.7)	3 (10.0)	0.23	0.890
Few	16 (53.3)	15 (50.0)		
Yes	12 (40.0)	12 (40.0)		

* Significance level at $\alpha = 0.05$

Characteristics of the participants from the control village: 50.0% were female, 43.3% were aged 30-45 years (mean= 50.5, SD=10.0), 90.0% were married, 96.7% were Christian, 100.0% were non-educated, 53.3% were employed daily, 87.7% had family annual income less than 50,000 baht, 63.3% were overweight, 13.3% could not speak Thai, and 10.0% could not understand Thai (Table 1).

Three variables were found to be different between groups: occupation (p-value=0.001), annual family income (p-value<0.001), and HT history of mothers (p-value=0.014) (Table 1).

Among people living in the intervention village, 26.7% smoked, 30.0% used alcohol, 76.6% did not exercise, 96.7% used moderate to high quantities of salt while cooking, and 100.0% used cooking oil in moderate to high quantities while practicing (Table 2).

Among those who lived in the control village, 16.7% smoked, 26.7% used alcohol, 80.0% did not exercise, 93.3% used moderate to high quantity of salt while cooking, 83.3% used moderate to high monosodium glutamate, and 70.0% used cooking oil in moderate to high quantities while practicing (Table 2).

Two variables were found to be statistically different between groups: the quantity of monosodium glutamate used for cooking (p-value <0.001), and the quantity of cooking oil used during cooking (p-value=0.004) (Table 2).

Table 2. Health behaviors among the participants

Health behaviors	Intervention n (%)	Control n (%)	χ^2	P-value
Smoking				
No	22 (73.3)	25 (83.3)	0.88	0.347
Yes	8 (26.7)	5 (16.7)		
Alcohol use				
No	21 (70.0)	22 (73.3)	0.08	0.774
Yes	9 (30.0)	8 (26.7)		
Opium use				
No	29 (96.7)	29 (96.7)	0.00	1.000
Yes	1 (3.3)	1 (3.3)		
Methamphetamine use				
No	30 (100.0)	30 (100.0)	N/A	N/A
Yes	0 (0.0)	0 (0.0)		
Glue use				
No	30 (100.0)	30 (100.0)	N/A	N/A
Yes	0 (0.0)	0 (0.0)		
Heroin use				
No	30 (100.0)	30 (100.0)	N/A	N/A
Yes	0 (0.0)	0 (0.0)		
Exercise				
No	23 (76.6)	24 (80.0)	0.13	0.935
Sometime	5 (16.7)	4 (13.3)		
Regular	2 (6.7)	2 (6.7)		
Quantity of salt for cooking				
High	11 (36.7)	7 (23.3)	3.55	0.169
Moderate	18 (60.0)	18 (60.0)		
Low	1 (3.3)	5 (16.7)		
Quantity of monosodium glutamate for cooking				
High	1 (3.3)	12 (40.0)	15.03	<0.001*
Moderate	24 (80.0)	13 (43.3)		
Low	1 (16.7)	5 (16.7)		
Quantity of oils for cooking				
High	5 (16.6)	3 (10.0)	10.63	0.004*
Moderate	25 (83.4)	18 (60.0)		
Low	0 (0.0)	9 (30.0)		

* Significance level at $\alpha = 0.05$

Regarding the comparison of biomarkers before and after the intervention among participants in the intervention group, no biomarker was found to be different. On the other hand, two biomarkers were found to have a statistically significant difference between the two measurements: triglycerides (p-value=0.027) and LDL-C (p-value=0.005) (Table 3).

Table 3. Comparisons of biomarkers before and after intervention among the intervention and control

Biomarker	n	Mean	SD	t	df	P-value
Intervention						
HbA1c (%)						
Before	30	5.05	1.05	-0.47	29	0.640
After	30	4.95	0.44			
Triglyceride (mg/dL)						
Before	30	159.73	202.89	-0.28	29	0.780
After	30	149.03	78.82			
Total cholesterol (mg/dL)						
Before	30	196.47	34.75	1.06	29	0.296
After	30	206.70	42.51			
LDL-C (mg/dL)						
Before	30	128.90	32.76	-1.69	29	0.101
After	30	116.60	35.35			
HDL -C (mg/dL)						
Before	30	46.07	7.88	1.95	29	0.061
After	30	49.77	9.17			
Control						
HbA1c (%)						
Before	30	5.03	1.67	-0.17	29	0.865
After	30	5.01	1.32			
Triglyceride (mg/dL)						
Before	30	164.37	111.58	2.32	29	0.027*
After	30	199.23	111.16			
Total cholesterol (mg/dL)						
Before	30	208.55	34.24	-0.01	29	0.991
After	30	208.43	38.25			
LDL-C (mg/dL)						
Before	30	132.00	38.66	-3.00	29	0.005*
After	30	115.77	32.54			
HDL -C (mg/dL)						
Before	30	50.70	10.19	0.21	29	0.835
After	30	51.20	9.38			

* Significance level at $\alpha = 0.05$

With regards to the comparison of knowledge and attitudes toward DM and HT prevention and control among the participants in the intervention, two items were found to be statistically significant: attitudes toward DM prevention and care (p-value=0.033), and knowledge about HT prevention and control (p-value=0.038) (Table 4). However, no statistical significance was found when the knowledge and attitudes toward DM and HT prevention and control among the participants in the control group were compared (Table 4).

Table 4. Comparison of knowledge and attitudes about DM and HT before and after intervention among intervention and control

Knowledge and Attitude	n	Mean	SD	t	df	P-value
Intervention						
Knowledge about DM prevention and care						
Before	30	4.03	1.49			
After	30	4.60	2.15	1.49	29	0.146
Attitude towards DM prevention and care						
Before	30	3.43	1.95			
After	30	4.23	2.04	2.24	29	0.033*
Knowledge about HT prevention and care						
Before	30	3.40	2.69			
After	30	4.66	2.24	2.17	29	0.038*
Attitudes towards HT prevention and care						
Before	30	4.56	2.02			
After	30	4.70	2.07	0.38	29	0.702
Control						
Knowledge about DM prevention and care						
Before	30	4.40	1.49			
After	30	4.13	1.07	-0.70	29	0.485
Attitudes toward DM prevention and care						
Before	30	3.40	1.10			
After	30	3.43	1.27	0.12	29	0.902
Knowledge about HT prevention and care						
Before	30	3.80	1.60			
After	30	4.03	1.40	0.67	29	0.504
Attitudes toward HT prevention and care						
Before	30	3.83	2.22			
After	30	3.86	1.35	0.75	29	0.941

* Significance level at $\alpha = 0.05$

There were no significant differences in biomarkers between the control and intervention groups before the intervention. However, post-intervention triglyceride values between both groups were significantly different (p-value=0.048) (Table 5). However, no statistical difference was detected in biomarkers, knowledge, and attitudes toward DM and HT prevention and care between the groups both before and after intervention (Table 5).

Discussion

The Akha people are of low socioeconomic status. A large proportion of participants never attended school and are overweight, one-fourth smoked and use alcohol. A large proportion use a high volume of salt, monosodium glutamate, and cooking oil in daily cooking practices [16]. After intervention, the biomarkers among the intervention decreased, while the control of some biomarkers increased. Knowledge and attitudes increased significantly among the intervention groups, but not among the control groups. Triglyceride levels were significantly decreased after intervention between the intervention and control groups.

Table 5. Comparisons of biomarkers and knowledge and attitudes about DM and HT before and after intervention between intervention and control

Item	Before		After	
	t	p-value	t	p-value
Biomarkers				
HbA1c (%)				
Control				
Intervention	0.46	0.963	-0.22	0.825
Triglyceride (mg/dL)				
Control				
Intervention	-0.11	0.913	-2.01	0.048*
Total cholesterol (mg/dL)				
Control				
Intervention	-1.35	0.182	-0.16	0.869
LDL-C (mg/dL)				
Control				
Intervention	-0.33	0.739	0.95	0.925
HDL-C (mg/dL)				
Control				
Intervention	-1.96	0.054	-0.59	0.552
Knowledge about DM prevention and care				
Control				
Intervention	-0.94	0.347	1.06	0.294
Attitudes toward DM prevention and care				
Control				
Intervention	0.81	0.936	1.81	0.074
Knowledge about HT prevention and care				
Control				
Intervention	-0.69	0.488	1.30	0.196
Attitudes toward HT prevention and care				
Control				
Intervention	1.33	0.188	1.84	0.070

* Significance level at $\alpha = 0.05$

In this study, the specific designed intervention program greatly reduced the risk of developing DM and HT among Akha adults, which manifested as a significant reduction in triglycerides among those in the intervention group compared to the control group. Due to the limitation of a short intervention time, only this biomarker was reported to be significant. Upon closer analysis, other biomarkers, especially lipid profiles, showed decreasing trends compared to the control groups, which showed increasing trends in some markers. Triglyceride levels are greatly affected by food consumption. This could imply that people in the intervention village had good knowledge and attitudes in preparing and cooking healthy food in their daily life after being provided training through the program. Moreover, the program’s demonstration of preparing food and cooking practices impacted Akha adults’ daily food consumption.

Several studies supported our approach in improving DM and HT among the adult populations by using a community-based intervention, which meant that it required engagement or involvement from all people in a community. A systematic study reported that providing knowledge to people in the community was a significant factor in improving DM, especially when there is community engagement throughout the program, which had a great impact on the desired outcomes [17]. Another systematic review on the effectiveness of a community-based intervention for prevention of type 2 diabetes in low-and middle-income countries demonstrated that a community-based intervention for addressing type 2 DM among adults was important in addressing DM [18]. A community participant program was implemented to improve DM in Thailand, and it was reported that promoting exercise in the community could significantly reduce individuals' BMI and other biomarkers after implementation for three months [19]. Correia et al. [20] reported that the most effective program to address DM and HT was a program that had been implemented by a community member and met the sustainability for control of DM and HT. Pereira et al. [21] reported that providing essential health information regarding DM and HT to people in a community could improve their knowledge on how to maintain their blood glucose and blood pressure. Shirvani et al. [22] also supported their findings after conducting a global systematic review and meta-analysis, showing that community-based educational interventions could be used as a tool or approach to effectively reduce the prevalence of type 2 DM.

A crucial factor influencing the prevalence of DM and HT among the hill tribe was their culture of cooking and dietary pattern. In our previous study [13], which was used as the information base to develop the intervention program in this study, Akha people were found to favor the use of large quantities of cooking oil, salt, and monosodium glutamate when cooking. Then, we used this information to modify their knowledge, attitudes, and practices to promote better practices in preparing food and cooking for themselves and their family members. This was supported by a study in Thailand, which reported that culture and norms were major factors that needed to be addressed to reduce the incidence of DM and HT [23].

This study has some limitations. First, language was one of the critical barriers, especially during educating the participants, wherein some were not able to understand Thai. This challenge was solved by translating all essential information to participants by the village headmen and the village health volunteers who were fluent in Thai. Second, spaces for conduction physical activities in the village is limited, and some of their preferred sports were not conducted, such as football. The location of the intervention village is

located at a small place at the top of the hill. However, the aerobic group dance was placed and received the most favor from the participants. Finally, many factors during the intervention could not be controlled for, which is common in community-based interventions. However, the major key characteristics of those who lived in the intervention and control villages did not differ. Moreover, people who lived in both villages were Akha and had the same culture and lifestyle; thus, the impact of the factors that were not controlled for, might not have interfered with the outcome.

At the end of the study, all interventions provided to the intervention village were provided to the people and participants in the control village. The people in the control village were trained on the standard program design, demonstration of healthy food preparation and cooking practices, and sports equipment. This was done to meet the standard for conducting intervention studies in the field.

Conclusion

Providing knowledge through specific training programs, including the demonstration of healthy dietary practices, to the hill tribe who are vulnerable to NCDs, especially DM and HT, can help improve key biomarkers for these diseases. Moreover, encouraging people to exercise by virtue of their own choice is another key factor in reducing the prevalence of DM and HT among the hill tribe. Therefore, having good knowledge through specific and carefully designed programs will improve attitudes toward good health, and practicing healthy food preparation and continuous exercise are expected to reduce the prevalence of DM and HT among hill tribe adults. The intervention program should be promoted among health professionals in the field.

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Maternal and Child Health Service for the Hill Tribe and Stateless Populations in Northern Thailand: Outcomes and Barriers

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ABSTRACT

Background: Maternal and child healthcare (MCH) services are a very significant health service for the safety of women and children during pregnancy, which is a standard and basic service for all people including the hill tribe and stateless populations lived in Thailand. This study aimed to investigate the health performance, health outcomes, and barriers to accessing MCH clinics from two district hospitals accessible to the hill tribe and stateless population in Chiang Rai, Thailand. **Methods:** Retrospective data collection and group discussions were performed to extract information to understand the situation and barriers to accessing MCH clinics among the hill tribe and stateless populations living in Mae Suai and Mae Fah Luang districts, Chiang Rai, Thailand. Data were collected from July to August 2021. **Results:** A number of child deliveries were performed by the Mae Suai district hospital every year; a high proportion with preterm delivery and low birth weight, less than 50.0% of pregnant women had early and complete access to antenatal clinics (ANC); more than 15.0% of pregnant hill tribe women were pregnant before age of 20 years. Only a few children were on the right developmental track, according to the standard development assessment tools. Several poor outcomes were detected among pregnant women and child births in Mae Fah Luang District; a low number of pregnant women visited the antenatal clinic and postpartum clinic, a large proportion had a high risk for pregnancy, 17.9% of children aged 6-12 months of age were diagnosed with anemia, 31.2% experienced asphyxia problems during delivery, and poor development among children had asphyxia and birth weight less than 2,500 g. Several challenges and barriers were detected in healthcare providers, such as poor attendance rate of early ANC due to their belief, poor personal hygiene related to postpartum care, substance use among pregnant women, and multiple pregnancies from poor rate family planning. In the clients' aspects, distance, lack of family and community support, and financial problems were major barriers. **Conclusion:** There is an urgent need to strengthen the current MCH system to improve the health and safety of the hill tribe and stateless populations by focusing on linking health information among institutes, improving professional skills to health care providers, and engaging community members in the system, including improvement of individual socioeconomic characteristics.

Keywords: Maternal and child health, Health system, Hill tribe, Barriers, Health Outcomes

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Introduction

Maternal and child healthcare (MCH) is one of the main health concerns globally. It is an indicator of having a standard health system in a country, especially in terms of accessibility to the system [1]. The World Health Organization (WHO) reported that approximately 810 women die from preventable causes related to pregnancy and childbirth every day, and 94.0% of all maternal deaths occur in low- and lower middle-income countries [2]. The major direct causes of death in pregnant women are antenatal hemorrhage, infection, high blood pressure, unsafe abortion, and obstructed labor. In contrast, the indirect causes are anemia, malaria, and heart disease [3]. Access to healthcare services is the principle of saving pregnant women's lives because the prevention of maternal mortality can be handled by a high skill of health professional in timely management. However, a number of pregnant women do not have access to healthcare, particularly those who are a minority in a country with specific sociodemographic characteristics facing several barriers in accessing the system which reflects inequalities in access to quality health services and highlights the gap between rich and poor [4, 5].

Thailand has a great healthcare system with a universal coverage scheme that aims to provide standard care and cover all medical fees of the citizens [6]. Health institutes under the Ministry of Health provide service to all basic clinics, including maternal and child healthcare from the national to village levels [7]. However, some marginalized populations living at the border areas of Thailand and Myanmar, such as hill tribe and stateless populations, are facing several barriers to healthcare access. This includes access to maternal and child healthcare clinics, which is the basic principle to all people [8].

There were more than 3.5-4.5 million hill tribe people who had been granted Thai citizenship and did not in 2020 [9,10]. These populations had their own culture, languages, and lifestyles, which were totally different from Thai local population [8, 11, 12]. Despite the availability of healthcare services to the Thai people, including the hill tribe and stateless populations, there was no guarantee that all these people could have equal access to these services. Several barriers to healthcare access had been identified, such as language [8], the distance of their habitats to the health institutes [8], financial problems [13], stigma [14], etc. Moreover, hill tribe women might be felt shame or perceived low self-esteem when they should come to health care service.

Among seventeen districts, Mae Suai and Mae Fah Luang districts, Chiang Rai Province are the favorite areas of the hill tribe and many hill tribe people lived these areas [8, 10]. Therefore, this study aimed to investigate the health caregiver performance, health outcomes, and barriers to accessing MCH clinics in two district hospitals serving the hill tribe and stateless

populations lived in Mae Suai and Mae Fah Luang districts in Chiang Rai, Thailand and to provide as a basis information about conditions and barriers on access to health care service during pregnancy and postpartum period. Health performance was assessed by the number and ratio of work and health professionals and also the work outcomes in each year.

Methods

Study design and study population

A descriptive design was used based on the combination of a retrospective data collection approach and focus group discussion. A retrospective data collection approach was used to extract the secondary sources of data on MCH outcomes of patients from Mae Suai and Mae Fah Luang district hospitals. In addition, a group discussion was conducted to gather the group's perspective among the hill tribe pregnant women and health care providers on the barriers and challenges in accessing MCH clinics located in hill tribe villages.

Sources of data and research instruments development

Secondary sources from two MCH clinics between 2017-2021 were selected and extracted after obtaining approval from the chief of clinics. All health performances and health outcomes existed in two hospitals between 2017-2021 were collected and analyzed. Several health outcome indicators were set before evaluating the sources of data, such as the number of pregnant women, number of pregnant women aged below 15 years, number of postpartum hemorrhages, number of childbirths with APGAR score ≤ 7 , number of childbirths with low birth weight, etc.

Two group discussions were conducted in each district: one among health care providers and another among hill tribe and stateless pregnant women. Six main question guides were developed and used in the group discussion among healthcare providers:

- 1) What are the major challenges in workflow in your MCH clinic?
- 2) How did you improve these challenges?
- 3) What are the critical points of care and management for hill tribe and stateless pregnant women?
- 4) Do you get involvement from the community to improve MCH and management? How?
- 5) What are the keys to success in working in the MCH clinics, particularly in caring and managing for the hill tribe and stateless population pregnant women?
- 6) What are the challenges of working among health institute networks in the district? How would you make it better?

Another five-question guide was used to gather information in the discussion among the hill tribe and stateless pregnant women:

- 1) Did you have any bad experiences while attending an MCH clinic?
- 2) What factors influence you to not visit the MCH clinic during your current or previous pregnancy?
- 3) What are the points of MCH clinics that should be improved? Why?
- 4) How was your husband or your family members involved in your care during pregnancy? Should it be improved?
- 5) Do you think the stigma impacts the hill tribe people who access MCH clinics?

The validity and reliability of the questionnaires were assessed by experts using the item-objective congruence (IOC) method. Three experts (medical anthropologists, MCH nurses, and public health professionals working in the MCH clinic) were invited to assess the questions related to the content and context of the study.

Data gathering procedures

The health professionals working at the MCH clinic in Mae Suai district (one district hospital and 12 health-promoting hospitals) and Mae Fah Luang district (one district hospital and 13 health-promoting hospitals) were invited to give their ideas according to the question guides. Two group discussions among the MCH clinic providers were held (eight people in a group discussion at Mae Suai district, and eight people in a group discussion at Mae Fah Luang district). Another two group discussions were conducted among pregnant women or those who recently experienced pregnancy and living in Mae Suai and Mae Fah Luang (11 pregnant women in Mae Suai district, and 7 pregnant women in Mae Fah Luang district). Group discussions were conducted between July and August 2021.

Statistics and ethical consideration

The descriptive data obtained retrospectively were presented as number and percentages. Moreover, the data obtained from the group discussions were analyzed in a thematic form. Study approval was obtained by the Chiang Rai Provincial Public Health Office Human Research Ethics Committee No. CRPPHO 69/2564, approved on 30 July 2021. Ethical considerations included the nature and processes of the study and protection of confidentiality.

Results

General information

A total of 133,846 hill tribes and stateless people lived in Mae Suai and Mae Fah Luang districts; 56,544 people lived in Mae Suai district, and 77,302 people live in Mae Fah Luang district.

Process of antenatal care

Pregnant women were advised by village health volunteers to visit a doctor at a district hospital or healthcare practitioners (a nurse or public health professional with antenatal care training) working at a health-promoting hospital near their village. During the first antenatal care (ANC), maternal health and fetal development were examined, including testing for HIV/AIDS, STDs, and other genetic-related diseases, as well as counseling, if necessary. Five consecutive appointments were scheduled before the labor. Pregnant women had to go through several procedures during the visits to ensure that mother and child were healthy. According to the standard ANC, a pregnant woman was required to meet a medical doctor three times: 1) to confirm gestational age, 2) scan to check for normal pregnancy, and 3) to double-check signs of abnormality before delivery. The healthcare procedures were performed according to the standards of ANC by the medical staff.

During labor, pregnant women were transferred to the labor and delivery room and cared for by a nurse. As many pregnant women in labor were admitted at a district hospital, the staff had hectic schedules. Postpartum care was handled by staff from the Department of Community Medicine and Epidemiology. In this stage, all postpartum women were checked for general health and training including breastfeeding and immunization for the child. Family planning was also an important activity to support postpartum women. Only one subdistrict was managed by the Department of Community Medicine and Epidemiology of a district hospital to provide services related to ANC, postpartum and childcare, and immunization. The remaining pregnant women were cared for by health practitioners working at 12 health-promoting hospitals. When a doctor was required for a check-up or delivery, pregnant women were referred to a district hospital. Due to its location, transportation to the hospital was not convenient, especially during the rainy season. The farthest hill tribe village is 1.30 hours away (on a motorcycle) from the hospital. The work related to the ANC process, labor, and postpartum care, including the EPI program, was performed manually by the health workers at a district hospital and health-promoting hospitals. All information on the services was written in documents and numbered. Any required data or information was requested manually. There was no specific link of data between a district hospital and the other health-promoting hospitals. Only a logbook was available for officially transferring messages between hospitals.

A. Mae Suai district

In 2020, there were 27,488 households in 126 villages with a total population of 84,378 people (67.0% of the hill tribe) in this area (seven subdistricts); with 42,485 men and 41,893 women.

Approximately 56,544 persons (27,141 men and 29,403 women) belonged to the hill tribe and stateless population. Seven tribes lived in this area: Akha, Lahu, Karn, Lisu, Yao, Chinese-Yunnan, and Hmong.

Health facility (as of 26 July 2021)

There is a 60-bedded district hospital with nine medical doctors, six pharmacists, seven dentists, and 73 nurses as well as 12 health-promoting hospitals with 88 public health professionals. The distance between Mae Suai Hospital and Chiang Rai Prachanukroh Hospital (tertiary hospital), located in the Muang Chiang Rai district, is 60 km.

Departments related to MCH at Mae Suai district hospital

Three departments are involved in the MCH services: the Department of Community Medicine and Epidemiology, Department of Dentistry, and Department of Labor. The first (three nurses and three public health professionals), provides all antenatal services, including laboratory tests, assessment of pregnancy risk, counseling, child development, and expanded immunization program (EPI). The second (seven dentists and seven nurse-aids) provides oral health examination, oral healthcare and health promotion for pregnant women. The third department (11 nurses and nurse-aids) handles the delivery procedures and MCH.

Key outcomes of MCH services from Mae Suai district hospital between 2017 and 2021

A large number of child deliveries were performed by the Mae Suai district hospital every year. Healthcare workers had been overworking for many years. Among the hill tribe and stateless populations, a large proportion of pregnant women had preterm delivery and low birth weight. A stateless population referred to those people who lived in Thailand but were not granted a Thai identification card (ID). Moreover, less than 50.0% of pregnant women had early and complete access to ANC and more than 15.0% of pregnant hill tribe women had been pregnant before 20 years. Postpartum hemorrhage was an important issue among the hill tribe women. Only a few children were on the right developmental track according to standard development assessment tools (Table 1).

B. Mae Fah Luang district

In 2020, there were 21,616 households in 77 villages comprising 77,302 people (100.0% are hill tribe); with 39,117 men and 38,185 women. Seven tribes live in this area (four subdistricts): Akha, Lahu, Lisu, Hmong, Lua, Chinese-Yunnan, and Thai-Yai.

Health facility (as of 26 July 2021)

A district hospital with a 30-bedded capacity and 13 health-promoting hospitals were available in Mae Fah Luang district. At the district hospital, seven medical doctors, three pharmacists, one dentist, and 40 nurses provided all medical services, including MCH

care. There were 61 health professionals working at 13 health-promoting hospitals. There is a 60 km distance between the district hospital and Chiang Rai Prachanukroh Hospital (Tertiary Hospital), which is located in the Muang Chiang Rai district, Chiang Rai province.

Key outcomes of MCH services at the Mae Fah Luang district hospital between 2018 and 2021

Several key MCH clinic performances at the Mae Fah Luang District were found, including a low number of visiting MCH clinics, a high rate of high-risk pregnant women, high proportion of postpartum hemorrhage (17.0%), anemic children aged 6-12 months (17.9%), asphyxia (31.2%), and poor development among children who had asphyxia and low birth weight (Table 2).

Key findings from group discussions

Four group discussions were conducted between July and August 2021 in the Mae Suai and Mae Fah Luang districts. Eight health practitioners working at the Mae Suai district participated in the first group discussion, and another eight health practitioners from the Mae Fah Luang district participated in the second group discussion. Several challenges to healthcare providers were identified:

- 1) There was no link in the information system between health institutes at the district level;
- 2) Poor knowledge, attitude, and perception of the hill tribe women and their partners on accessing MCH care during pregnancy;
- 3) Language barriers between clients and healthcare workers;
- 4) Illiteracy and inability to understand messages from healthcare providers;
- 5) Only a passive service available,
- 6) Poor access to reproductive control clinics; and
- 7) Malnutrition among pregnant women.

Additionally, major barriers and challenges to pregnant women were identified, such as

- 1) Lack of support at the family and village levels;
- 2) Financial problems;
- 3) Difficulty in transportation of pregnant women to access MCH;
- 4) Difficulty in visiting a doctor;
- 5) Fear of communication with health officers or unfriendly healthcare providers; and
- 6) Specific beliefs and practices during pregnancy and post-delivery impact on mother and child health.

Table 1 Work performances of antenatal care and delivery services at Mae Suai District Hospital, 2017-2021

Item	2017	2018	2019	2020	2021 (6 months)
Total delivery	574	566	511	458	210
- Hill tribe	479(83.5)	469(82.8)	395(77.3)	351(76.6)	162(77.1)
- Stateless population	30(5.2)	37(8.5)	95(18.6)	140(30.6)	49(23.3)
LBW	40	35	28	30	5
Preterm with LBW	16	11	9	22	4
Mother HCT<33%	11	10	8	17	6
Postpartum hemorrhage	24(4.3)	16(2.8)	13(2.5)	13(2.8)	3(1.43)
Birth asphyxia (BA)	15	11	8	9	0
No ANC	6	7	6	9	7
Complete ANC	234(40.7)	282(49.8)	254(49.7)	266(58.1)	128(61.0)
Early ANC	270(47.0)	303(53.5)	266(52.0)	272(59.4)	128(60.9)
TT	548(95.4)	552(97.5)	487(95.3)	266(95.6)	196(93.3)
Episiotomy	465(81.0)	474(83.8)	409(80.0)	400(87.3)	117(84.3)
Disrupted episiotomy	21(4.6)	72(15.2)	63(12.3)	31(7.8)	2(1.1)
HIV +	4(0.7)	2(0.4)	2(0.4)	3(0.7)	1(0.5)
Mother aged less than 15 years	3(0.5)	7(1.3)	3(0.6)	4(0.9)	3(1.43)
Pregnant before aged 20 years	132 (23.0)	111(19.6)	99(19.4)	83(18.1)	38(18.1)
Pregnant aged after 35 years	N/A	N/A	123(14.7)	121(14.9)	16(4.3)
Multiple pregnant before aged 20 years	N/A	N/A	32(3.8)	35(4.3)	16(4.3)
• Children aged less than 6 months were fed breast milk only	N/A	N/A	N/A	N/A	595/646 (91.9)
• Children aged 6-12 months were detected as anemia	N/A	N/A	N/A	N/A	76/221 (34.4)
• Children with birth asphyxia during delivery and had APGAR score less than 7, have been detected the development by DSPM, and % of abnormal	N/A	N/A	N/A	N/A	403/(68/241) (28.2)
• Children with birthweight less than 2,500 grams at delivery, were detected the development by DSPM, % of abnormal	N/A	N/A	N/A	N/A	61/(21/37) (56.7)
• Lived birth from mother aged less than 20, and were detected the development by DSPM and % of abnormal	N/A	N/A	N/A	N/A	275/(57/163) (34.9)

Table 2 Work performances of antenatal care and delivery services at Mae Fah Luang District Hospital, 2018-2021

Item	2018	2019	2020	2021 (6 months)
Total ANC	348	239	273	178
Having 1 st ANC within 12 weeks of gestational age	N/A	N/A	N/A	162/178(91.1)
Completely 5-time ANC before delivery	N/A	N/A	N/A	147/176 (83.5)
Received three times post-delivery care	N/A	N/A	N/A	114/195(58.5)
Having a risk for pregnancy as the MOPH indicators	N/A	40	48	76
Delivery at the hospital	N/A	415	260	257
Death (child)	N/A	1	0	0
Referred to Chiang Rai Prachanukroh (Tertiary hospital)	N/A	N/A	N/A	44
Postpartum hemorrhage	N/A	23.0%	25.0%	17.0%
LBW	24/608 (3.9%)	35/620 (5.6%)	34/650 (5.2%)	13/361 (3.5%)
• Children aged less than 6 months were fed breast milk only	N/A	N/A	N/A	567/659 (86.0%)
• Children aged 6-12 months were detected as anemia	N/A	N/A	N/A	38/212 (17.9%)
• Children with birth asphyxia during delivery and had APGAR score less than 7, have been detected the development by DSPM, and % of abnormal	N/A	N/A	N/A	221/ (25/80) (31.2%)
• Children with birth weight less than 2,500 grams at delivery, were detected the development by DSPM, % of abnormal	N/A	N/A	N/A	50/ (10/23) (43.4%)
• Lived birth from mother aged less than 20, and were detected the development by DSPM and % of abnormal	N/A	N/A	N/A	174/(21/63) (33.3)

Discussion

The hill tribe and stateless pregnant women faced several challenges in accessing MCH clinics, and the outcomes did not reach some of the Ministry of Public Health Key Performance Indexes (KPIs). Several health problems were identified among them, such as postpartum hemorrhage, poor rate of early antenatal care, poor rate of complete ANC, high of birth before admitted rate, high rate of disrupted episiotomy, high rate of pregnancy before 20 years of age, and multiple pregnancies. Both system and individual challenges were detected in MCH clinics, such as lack of a single platform of information linkage system among hospitals, availability of only passive clinics, poor access to reproductive clinics, and malnutrition. Additionally, language, distance, family finance, and unhealthy mother and child, which were related to the tribe's belief and practice were detected.

The hill tribe and stateless pregnant women received MCH under the national standard of MCH indicators, despite the current MCH care service (passive method) and its system, and their socioeconomic backgrounds. Many unreached indicators were caused by the current existing ANC system, while the others were caused by a non-active approach in reaching the target populations. The local MCH staff preferred to have an active MCH clinic to improve the maternal and child health among the hill tribe and stateless populations. Jongh et al. [15] reported that the perspectives of service users and providers, social and political factors, and health system characteristics were related to health outcomes in MCH clinics in low- and middle-income countries. Furthermore, community-based dialog study reported that limited health service promotion and poor accessibility to health facilities were detected as major barriers to health service utilization [16]. Several studies [17, 18] reported that unfriendly maternal health service providers were an important factor in reducing the rate of MCH clinic utilization among pregnant women.

Moreover, the language, beliefs, knowledge, and attitudes of the hill tribe and stateless pregnant women were also considered as barriers to accessing MCH clinics. A meta-analysis reported that language was a key barrier for MCH clinics globally [19]. Moreover, a systematic review reported that negative attitudes and behaviors of pregnant women undermined health care seeking and affected mother and child well-being [20]. Pahwa et al. [21] reported that the individuals' attitudes impacted the MCH clinic utilization among Indian pregnant women. A study in Nigeria clearly demonstrated that the knowledge and attitude toward access to MCH were significant factors in clinic utilization [22].

Family and community support were also key factors in increasing the access to MCH clinics. This was supported by a study in Myanmar, which reported

that geographical setting, household income, and access to transportation were associated with accessing MCH clinics among pregnant women [23]. Dahab et al. [24] also reported that family economic status was one of the key barriers to accessing MCH clinics among pregnant women living in low-income countries.

Geographical barriers such as distance and transportation were also identified as another key factor in reducing the access to MCH clinics among the hill tribe and stateless pregnant women. Dahab et al. [24] reported that the most important barrier to maternal health is the transportation to health facilities. A study in Uganda reported that distance and transportation costs were key factors in accessing MCH clinics among pregnant women in Uganda [17], while another study in Nigeria reported that geographic difficulty and distance were major barriers to access to MCH among pregnant women [25].

Our study had some limitations. First, based on a retrospective data collection process, the completeness of data and the information system used in the two MCH clinics were different; therefore, it was very difficult to analyze the comparison between the two clinics. Second, many work-performance indicators were collected on based on paper, which was a barrier to the completion of data for the analysis. Finally, the difference in the hill tribes living in the two areas might impact the outcomes of MCH clinics, which were not completely compared between the two clinics.

Conclusion

The hill tribe and stateless women should have access to the MCH clinics during their pregnancy to receive standard care and services. The information linkage system among health institutes in a district is a key factor in improving the quality of the service. Furthermore, it is necessary to get the involvement of family members and the community to improve MCH outcomes for the hill tribe and stateless pregnant women, including having translators to help in reducing the misunderstanding between the patients and healthcare providers. Many factors act as significant barriers to the access to MCH, such as language, knowledge and attitude, belief, and distance and transportation. Implementation research by collaborating with all stakeholders should be considered to improve the quality of MCH clinics for these populations.

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Learning and Health Impacts of COVID-19 Prevention and Control Measures among the Hill Tribe Schoolchildren of Northern Thailand: A Teacher's Perspective

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ABSTRACT

Background: The coronavirus disease 2019 (COVID-19) pandemic impacts all populations across different dimensions. Schoolchildren have been one of the most affected groups by the prevention and control measures that were implemented. This study aimed to understand the impact of the prevention and control measures against COVID-19 on hill tribe schoolchildren. **Method:** The study included school directors and teachers working in schools and daycare centers (DCCs) in the hill tribe villages. A qualitative method was used to elicit information about the impacts of COVID-19 prevention and control measures in teaching, learning, and health among hill tribe schoolchildren. The participants were asked several questions. Thematic analysis was used to extract information and study the patterns of the findings. **Results:** A total of 22 participants, seven school directors, and 15 teachers from four schools and three DCCs were selected to participate in the study. Among them, 72.7% were female, 63.6% had a bachelor's degree, and the mean age was 44.1 years. Educational and health impacts were found with the implementation of prevention and control measures for COVID-19, and two major forms were detected: educational and health impacts. Regarding the impact on education, the students were found to have difficulties in online learning platforms. In addition, poor parental support and the inability to buy educational tools and equipment for online learning platforms made it more challenging. In terms of health, the students lost the opportunity to be cared for by professionals, lacked practice of interpersonal skills, and lacked access to healthy food. **Conclusion:** With no better option, hill tribe students were forced to modify their learning styles without any learning materials or equipment available. The children were not able to consume the recommended quantity and quality of food provided by the government at school and DCCs. All government offices including school directors should emphasize on improvement the approaches to ensure that students are able to learn on their maximized capacity in learning inducing the method to provide lunch with quality and quantity food for all students.

Keywords: *Impacts, COVID-19, Prevention and control measures, Hill tribe, Schoolchildren*

Introduction

Coronavirus disease 2019 (COVID-19) was first officially recognized by the World Health Organization in early 2020 [1, 2]. After the first report emerged, the disease was defined as the major global threat [3, 4], killing a large number of people worldwide [5, 6]. Till August 4, 2021, more than 200 million people were infected and more than 4.2 million had died globally [7]. Almost all people of all ages have been impacted by the pandemic, including schoolchildren [8-10]. The transmission of the virus could be airborne or through respiratory droplets (close contact); thus, the infectivity

rate is more than what is expected and could be widely spread even in remote areas of a country. Its effect was clear among students who were attending class-based traditional teaching, and could be exponential in those from poor families, such as the hill tribe in Thailand.

The hill tribe children in Thailand lived with poor families and parents with low educational attainment [11-13]. Low family socioeconomic status (SES) could affect the parents' ability to support their children in maximizing their ability to learn in school [14-16]. Parents supporting their children could positively impact their learning [17, 18]. With the shift of the

learning platform to the online system during the pandemic, the parents' support was the key to the success of learning among children in this era [19, 20]. However, this would not be widely possible among some individuals with limited resources such as the hill tribe population.

In Thailand, schoolchildren have health benefits because the government provides healthy food at lunch time, and milk for all children at the elementary level. Many schoolchildren have the opportunity to eat good food, including milk, which has much more nutrients than the food from their household [21-24]. The growth of few children aged < 7 years who were attending DCCs was properly stimulated with the help of the professional staff working at the DCC [25-27]. Therefore, the lack of opportunity to attend DCC could have a negative impact on children's growth [28].

This qualitative study aimed to understand the impacts of the implementation of prevention and control measures against COVID-19 on hill tribe schoolchildren through the perspective of the teachers working in the hill tribe community.

Methods

A qualitative method was used to elicit information from the participants. The participants included teachers and school directors working in schools and DCCs in the hill tribe villages. After reviewing the literature and discussing with the researchers, the questions for the interviews were developed and validated by one educational expert and two public health professionals using the item-objective congruence method. A pilot testing was conducted among three interviewees who were working in a school to ensure that the questions adequately covered the context of the study. Finally, the following seven questions were selected as the question guide for the study: (a) How did COVID-19 impact students' learning? b) How do prevention and control measures impact students' learning? c) How did you address these problems? d) How do parents support their children's learning? e) Can you explain the impact of the measures on your students' health? f) Did the students or their parents request anything from school? and g) How will you maintain education and health in your students if the pandemic lasts a long time?

The participants were selected using a purposive method and an appointment was made three days ahead. On the date of the interview, an informed consent was obtained, and the participants provided the necessary information for the study. The interviews lasted for approximately 40 minutes. All interviews were recorded after obtaining the approval of the participants.

All records were transcribed into text and checked for errors. Before further analysis, the transcripts were sent back to the information owner to check for

accuracy. A thematic analysis was used to study the patterns from the transcripts using the experience of the researchers with different backgrounds (two educators, one public health professional) and the NVivo program (NVivo, qualitative data analysis software; QSR International Pty Ltd., version 11, 2015). The final patterns extracted were sent back to the information owner again to ensure that the interpretation was accurate.

All study procedures and research tools were approved by the Chiang Rai Public Health Human Research Ethics Committee (IRB No. CRPPHO 73-2563).

Results

A total of 22 participants (seven school directors and 15 teachers) from four schools and three DCCs were selected to provide information in the study. Among them, 72.7% were female, 63.6% had a bachelor's degree, the mean age was 44.1 years (range, 27-59 years), 50.0% had 3-4 years teaching experience. According to the in-depth interviews of the participants, three education and three health impacts were discovered.

A. Educational impacts

Three major impacts of the COVID-19 pandemic on the education of the hill tribe schoolchildren were detected, including unfamiliar online learning, poor parental support, and lack of educational materials and equipment.

Teaching and learning

During the pandemic, all class-based teachings were modified into online teaching and learning platforms, or a combination of both. Before the pandemic, all teaching and learning activities were executed based on the interaction between students and teachers. This was the common and normal teaching and learning approach in the Thai educational system over the past few years. The modification of teaching and learning into online systems has emerged immediately due to the COVID-19 pandemic. The impacts were greatly experienced by both the teachers and students, especially by those who had poor information technology skills.

A 27-year-old female teacher said [P#8],

"It was very difficult to become familiar with the online teaching platform. I do know that we have to modify ourselves to serve our students best; however, I am facing a lot of problems in my life at this time."

A 34-year-old male teacher said [P#10],

"I have worked as a teacher in this school for more than 10 years, and this pandemic has had the most negative impact on my professional life. I am very worried about teaching my students. I wish everything would come to pass in the next few days, but... I think

we have to adapt ourselves to the new situation. I have tried to use an online platform for teaching for a while but still need to improve my skill. Many of my friends also worry about the same thing. We are sharing ideas to help our students maximize their learning from the classes.”

Among the students, they had a great impact on online class learning. Having familiarity with the internet and accessing information online platforms among hill tribe students was very challenging. Moreover, under the condition of several waves of the pandemic, running in class and being teaching in online platform switches daily required a strong guideline or policy for the implementation.

A 44-year-old male school director said [P#15],

“It is very difficult to prepare for and respond to the situation because sometimes no cases are reported in this area; therefore, both teachers and students go back to school. A few weeks later, the new epidemic is reported, so we have to move all teaching and learning into the online platform. In this area, the use of the internet is very limited and it impacts our students’ access to their online classes. Moreover, the hill tribe people are living in a very poor economy, so anything that is required for additional expenses will be a burden to them.”

A 37-year-old female school teacher said [P#20],

“Online learning is not good for my students because in villages, the network signal required to access the internet is not available and online teaching does not motivate students to follow the content.”

Both teachers and students were suffering from the online teaching and learning platform brought about by the requirement of social distancing during the pandemic. This was due to the unfamiliarity with the use of new teaching technology and the lack of support from the government. Moreover, the students were unmotivated and had internet connection problems.

Poor parental support

A large proportion of the families living in hill tribe in Thailand come from a low SES and have a low educational attainment. Individuals aged 45 years and above were very limited to the use of Thai. Due to the low SES and educational attainment of the parents of the hill tribe students, supporting their children in learning was impossible. Moreover, their jobs, such as farming, were not enough to help and support their children’s education according to their class schedules.

A 44-year-old male school director said [P#15],

“We know that the parents are using most of their day time in their farm; therefore, attention to help their children or support their children is not possible.”

A 51-year-old female school director said [P#9],

“I have been working in this school for more than 6 years, I do know how my students’ parents are suffering in their life. Most parents did not attend school, and it was impossible to help their children learn the teaching through the online platform provided.”

A 27-year-old female teacher said [P#8],

“I would say that currently my students are living in the stage of very non-effective learning in their classes. I have tried to help them understand how to use the platform and tried to use the simple platform, but...it is very limited.”

With the low SES of the parents, helping and supporting their children’s education was not effective because they never went school, and had no knowledge or skills in technology.

Lack of educational material and equipment

Almost all hill tribe students came from poor families, making it difficult to obtain technological materials and equipment for online learning. Their parents did not have the money to buy a computer or have access to the internet, which was required for the new platform for education.

A 27-year-old female teacher said [P#22],

“Last week while I told my students that we needed to run the class in online platform, they said that they do not have a computer and some responded that there was no internet signal in their village.”

A 44-year-old school director said following [P#15]

“Parents have shown concern that they have no money to buy equipment for online learning. Some people said that they have no money even for food. How they can pay for this very expensive equipment?”

The hill tribe people were not able to buy new education equipment for their children, such as computers and other equipment needed to access the class.

B. Health impacts

Health impacts caused by the modified platform of learning and teaching were detected. Following the COVID-19 prevention and control guidelines, all schools were not allowed to conduct face-to-face classes. With online learning, students faced several challenges in terms of health.

Lacking opportunity to be cared for by a childhood development professional

All children aged below 7 years were cared for in DCC during the daytime while their parents were farming. At the DCC, they were cared for by

professional staff to ensure that all children were supported and stimulated properly for their growth.

A 29-year-old woman working at a DCC said [P#16],
“I worry very much about all my younger students that they might not be cared for properly while they could not come to DCC. I think you know that children aged below 7 years are in a very important stage for development in both physical and mental skills, including interpersonal skills. Yes, we are losing the great time to support them.”

A 33-year-old woman working at a DCC said [P#5],
“We have no other option during the implementation of the COVID-19 prevention and control measures as all DCCs are not allowed to open. Now, I have no idea what is going on with my younger students.”

Lacking practice of interpersonal skills

By attending the DCCs, the children were trained to develop their interpersonal skills, including some essential social skills under the norms. Under the condition that many children were cared for in the same place (at DCC), they were automatically being trained for interpersonal skills. Moreover, children were prepared to enter the elementary level, such as understanding Thai alphabets and basic grammar.

A 33-year-old woman working at a DCC said [P#5],
“I think children are losing time to practice their interpersonal skills while the DCCs are not allowed to open. I hope that the government will have a better option to address this problem.”

A 29-year-old woman working at a DCC said [P#16],
“One very worrying thing to me is how we make sure that the young children have been trained properly before entering an elementary school, especially their interpersonal skills which are totally missing if the DCC is not opened.”

A 39-year-old man working at a school said [P#13],
“I am a sport teacher. I am very concern that my students would lack the opportunity to skill on playing sports including interpersonal skill development from the school close policy and implementation and it might impact their health as well”

Lacking access healthy food for children

All children attending a DCC were provided with healthy food that met both quality and quantity. The menu was designed and approved by a nutritionist. Therefore, all children ate healthy food for their health, which is very important for their development.

A 29-year-old woman working at a DCC said [P#16],
“At the DCC, we have good food and milk for all children every day. I am wondering how my students get food while our DCC is closed.”

A 46-year-old female head of a DCC said [P#1],
“Basically, we make a schedule of the menu for students weekly. We consulted nutritionist experts to plan a diet for them. But today, I have no better idea of how the students get healthy food and milk at their home.”

A 46-year-old woman working at a school said [P#19],
“During the school close days, my students lack opportunity to have healthy lunch, I so sad”

Discussion

Due to the implementation of COVID-19 prevention and control measures, the DCCs and elementary schools were closed. This resulted to the suffering of hill tribe children in the aspects of health and education. In terms of education, the hill tribe children had difficulties with the new online learning platform, which was influenced by the need for technology and internet access. Poor parental support in online learning may be due to the poor educational status of the parents and lack of financial support for buying computers needed for online learning. With regard to health, children lost their opportunity to be cared for by professionals, especially those who needed continuous support for their proper development, including interpersonal skill development. One very significant outcome of the online platform was the lack of access healthy food in terms of both quantity and quality, which is required for development.

In this study, we discovered several forms of difficulties in the online learning platform brought about by the COVID-19 prevention and control measures. The hill tribe schoolchildren suffered from poor skills in technology, limited access to the internet, lack of support from their parents, and lack of access to online learning tools and equipment. This was supported by a study conducted in the Netherlands, which reported that students made little or no progress while learning from home [9]. Alsoud et al. [29] reported that students from remote and disadvantaged areas faced enormous challenges, such as technological accessibility and poor internet connectivity. Espino-Diaz et al. [30] demonstrated several disadvantages of online learning, such as the lack of social interaction, the lack of technological knowledge necessary to face online teaching and learning, and the quality of tools and equipment. The literature review research reported that more than 94% of students worldwide are now losing their life in a school, and several approaches and technological innovations were required to improve the educational system, especially for children living in disadvantaged stages who were having poor

access to educational equipment and the internet [31]. A small study in Thailand clearly reported that the online learning platform was a problem not only for children in remote areas like the hill tribe schoolchildren, but also for students living in urban areas [32]. The United Nations reported that schoolchildren were one of the groups of people in Thailand who were impacted by the COVID-19 pandemic, and the government had to urgently seek the solution because the pandemic might last for years [33]. Schoolchildren are facing great impact from the COVID-19 pandemic, especially in accessing education. This could potentially affect children living in poor families and remote areas such as the hill tribe schoolchildren in Thailand.

We found that not being able to go to school during the COVID-19 pandemic resulted in a loss of opportunities for the children to practice interpersonal skills with their peers. Furthermore, they also lost the opportunity to eat healthy food and receive professional care for their proper growth. A narrative review reported that during school closure, the mortality of children has been increasing in several countries, including Cameroon, Pakistan, and the United States [34]. Additionally, a rapid systematic review reported that during school closure, students faced several physical and mental health problems, including accidents, increased anxiety and loneliness, sadness, hyperactivity, and increased body mass index due to less physical activity [35]. The United Nations International Children's Emergency Fund reported that school closures impact both education and health, especially the nutrition of students, which is of great concern to all relevant agencies in a country [36]. Mayurasakorn et al. [37] reported that the closure of schools during the COVID-19 pandemic could cause children to have malnutrition due to the lack of access to healthy food from lunch programs provided by the government, especially in low- and middle-income countries, including Thailand. Therefore, school closure has not only limited its impact on students' learning, but also students' health in both physical and mental aspects.

This study had limitations. The interviews of some participants were conducted online, which might have caused the loss of some information that was presented in the form of body language. Since this study was based on the teachers' views, further studies should be conducted including the parents' and children's views to gain more perspective on the effects of COVID-19 on learning.

Conclusion

The hill tribe children are having difficulties in terms of health and education, which are due to the COVID-19 pandemic. Children are facing challenges in online learning platforms, with limited support from the government, schools, and their parents.

Additionally, children are losing their opportunity to be cared for by professionals to support them in proper development due to the closure of schools and DCCs. They are also losing the opportunity to practice their interpersonal skills and get healthy food in terms of quantity and quality. All relevant agencies should promptly respond to these problems to meet the basic needs of all children by supporting them with essential tools and equipment for their learning, giving access to good food, and providing the opportunity to be cared for and properly supported for development in childhood. All relevant agencies should revise their plan to support online learning and care for school children effectively especially providing lunch with quantity and quality food to all students.

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