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Associations between socioeconomic status and adherence to hypertension treatment among older adults in urban and rural areas in Myanmar: a cross-sectional study using baseline data from the JAGES in Myanmar prospective cohort study

Yuiko Nagamine ,[1,2] Yugo Shobugawa ,[3] Yuri Sasaki,[4] Daisuke Takagi,[5] Takeo Fujiwara ,[1] Yu Par Khin,[1] Ikuma Nozaki,[6] Yuki Shirakura,[3] Lwin Kay Thi,[7] Zin Poe Ei,[8] Zarchibo Thae,[8] Hla Hla Win[8]

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For numbered affiliations see end of article.

Correspondence to
Dr Yuiko Nagamine;
yuiko.mail@gmail.com

ABSTRACT

Objectives This study aims to investigate whether there is a differential association between socioeconomic status (SES) and adherence to hypertension medication among older adults in rural and urban areas in Myanmar and assess what type of SES is associated with a difference.

Design Cross-sectional study using baseline data from the Japan Gerontological Evaluation Study in Myanmar prospective cohort study. A multistage random sampling method was applied in each region.

Setting An urban and a rural area in Myanmar.

Participants A total of 1200 older adults over 60 years old in Myanmar were randomly selected in 2018 (600 each from rural and urban areas). Of them, 573 had hypertension and were eligible for the analysis (urban: 317, rural: 256).

Outcome Adherence to hypertension medication (yes/no) is the outcome of interest. Three types of SES (wealth, education and current employment status) were the independent variables.

Results We found that 21.5% of urban residents and 48.4% of rural residents were non-adherent in the study population. Poisson regression modelling stratified by area was performed to estimate the prevalence ratios (PRs) of not following treatment instructions. Demographic information and complications of hypertension were adjusted for in all models as possible confounders. In terms of SES, middle level of wealth compared with low level was significantly associated with poor adherence (PR 2.68, 95% CI 1.28 to 5.59) in the urban area, but education and employment status did not show similar associations. Lower education compared with middle/high school or higher was significantly associated with poor adherence in the rural area (no school: PR 3.22, 1.37–7.58; monastic: 3.42, 1.16–5.07; primary school: 2.41, 1.18–4.95), but wealth and income did not show similar associations.

Conclusions SES and adherence to hypertension medication were differently associated among older adults in rural and urban areas in Myanmar. To ensure healthcare access to hypertension treatment for every citizen, the differential association between SES and adherence in urban/rural areas needs to be recognised.

STRENGTHS AND LIMITATIONS OF THIS STUDY

⇒ Since a population-proportionate random sampling method was applied to the study in urban and rural areas, regional difference can be compared in the data.
⇒ A relatively low response rate of the study may affect the study result (although the response rate was not statistically different between urban and rural areas).
⇒ The result may not represent the whole older population in Myanmar because only 2 regions out of 14 regions/states in Myanmar were surveyed in the study.
⇒ With regards to the calculation of wealth, rural assets may not be accurately reflected, as some items that may be relevant to rural asset status, such as the presence of livestock, were not included in the survey instrument.
⇒ As a measure of adherence, scores such as the MMAS-8 could not be used in the study, so adherence-related factors may not be fully taken into account.

INTRODUCTION

According to WHO, cardiovascular disease (CVD) is the number one cause of death worldwide.[1] Hypertension is one of the chronic diseases strongly associated with cardiovascular morbidity and mortality. It affects more than 1.1 billion people worldwide; 1 in

4 men and 1 in 5 women.[2] Furthermore, hypertension has been the top CVD burden attributable to modifiable risk factors in at least the past three decades.[3] In Asia, the prevalence of poor adherence to antihypertensive medications was reported to be 48%, which was relatively high compared with other regions.[4] The rapid ageing of the population also contributes to this situation through a decrease in income due to retirement, and difficulty in consulting a doctor, for example, due to a decline in physical and cognitive functions.[5] When considering the target of universal health coverage, it is crucial to identify the factors associated with access to treatment and maintenance of adherence in each country.

Treatment of hypertension is a long-term process, often lasting until the end of life. While ensuring continuity is very important, many social factors can hamper this effort. In 2003, the first official definition of adherence was published by WHO. The definition was 'the extent to which a person's behavior – taking medication, following a diet, and executing lifestyle changes, corresponds with agreed recommendations from a health care provider'.[6] Although the concept of adherence has evolved gradually, the five categories that affect adherence and their details based on this definition, that is, sociodemographic, healthcare team/healthcare system, therapy-related, condition-related and patient-related, are still relevant today.[6 7]

The sociodemographic factors related to poor adherence to antihypertensives, which is the main focus of this study, were as follows: younger age,[6 8] male sex,[9] minority,[7 10] low income,[11 12] low wealth,[13 14] low education,[15] not favourable job,[16] being employed,[17] unstable residence,[6] few social support,[18] high co-payments[19] and war.[20] However, the association between residential regions, such as urban-rural difference, and non-adherence is controversial. Some studies showed that urban residents have lower adherence than rural residents (Brazil, USA),[8 9] while others showed the opposite (India, Pakistan and Bangladesh).[21] Furthermore, one study showed a null result (USA).[22] Although we know that the prevalence of hypertension is higher in urban than in rural areas in low-income and middle-income countries (LMICs),[21 23] it is not clear what makes the urban-rural difference of adherence in LMICs. As extracted from the literature review mentioned above, socioeconomic status (SES), such as wealth, education and working status, is one of the most important determinants of adherence globally. However, it has yet to be clarified whether the association between SES and adherence to hypertensive medications is different in rural and urban areas. It is important to investigate the type of SES that could be differently related in both urban and rural areas to gain more information about the appropriate interventions.

Myanmar is now considered one of the least developed countries in the world,[24] but as other south-east Asian countries,[5] it is one of the countries that is likely to face the same challenges of dealing with chronic diseases. In Myanmar, the prevalence of hypertension was 20%–30% in 2014,[25] a percentage similar to that of other LMICs.[26] Although the risk factors for hypertension in Myanmar, such as being female, living in urban areas and lacking physical activity at work,[25] are gradually becoming more evident, adherence to hypertension treatment and related factors have not been investigated.

According to the United Nations Population Fund, in Myanmar in 2015, 30% of the population lived in urban areas while 70% in rural areas. Like other LMICs, the disparity between the poor and the rich could be wider in urban areas than in rural areas.[27] Conversely, the amount of information and the opportunities to learn that could influence adherence are more affluent in urban areas than in rural areas. Therefore, the potential relationship between SES and adherence may differ in urban and rural areas.

The purpose of this study, which used data collected from the rural and urban regions of Myanmar, is to determine (1) Whether there is a differential association between SES and adherence to hypertension medication in rural and urban areas and (2) Which type of SES is associated with such a difference.

METHODS

Study design and participants

The study is an analysis of cross-sectional baseline data from the longitudinal study, the Healthy and Active Ageing in Myanmar (Japan Gerontological Evaluation Study (JAGES) in Myanmar 2018) prospective cohort study.[28] The study aims to clarify SES affecting active ageing in Myanmar. The study participants comprised 1200 community-dwelling older people in Myanmar aged 60 years and over. Of the 1200 participants, 600 were recruited from urban Yangon (population density was 716/km^2),[29] and the remaining 600 were from Bago, a rural area located about 90 km north-west of Yangon (population density was 124/km^2).[29]

A multistage random sampling method was applied in each region. Six townships, each from Yangon with 35 townships and Bago with 28 townships, were randomly selected by population-proportionated sampling. Then, 10 wards were randomly selected from Yangon, and 10 village tracts were randomly selected from Bago. In the rural areas of Myanmar, sometimes there is more than one village in a single village tract, so in such cases, one of them was further randomly selected. Ward is the smallest unit of residential area in the urban areas in Myanmar, and village tract is the smallest unit in rural areas. In this study, we treated Yangon as an urban area and Bago as a rural area.

Trained surveyors with public health nurses visited the study participants' homes and conducted interviews based on the survey questionnaire. In Yangon, they visited the homes of 1083 older adults. Of these, 610 were at home (contact rate=56.3%). Among them, 10 were excluded because of refusal to participate (n=6) or severely cognitively impaired or bedridden to the extent that they could

not respond to the survey (n=4). Thus, the cooperation rate was 98.5% and the participation rate was 55.5% (0.563 × 0.985=0.555) in Yangon. In Bago, the surveyors visited 1044 people, and 694 were at home (contact rate=66.5%). Of these, 94 were cognitively impaired or bedridden and were excluded from the study. Therefore, the cooperation rate was 86.5% and the participation rate was 57.5% (0.665 × 0.865=0.575) in Bago.

Among the total participants, 573 were diagnosed with hypertension and were receiving a prescription. They were included in the analysis of this study since the outcome of the analysis was adherence to hypertension treatment (Yangon: 317; Bago: 256).

Questionnaire

We developed a structured questionnaire for face-to-face interviews based on the JAGES Questionnaire. The JAGES is a nationwide epidemiological survey conducted since 1999 to analyse the factors and social determinants of active ageing in Japan among older people who have not been certified as requiring care. The questionnaire was first translated from Japanese to English, from English to the local language, Burmese, and then back-translated to English to check for any discrepancies in the content. The validation of the questionnaire was conducted based on the *Linguistic Validation Manual*.[30]

Dependent variable

As the outcome measure, we used the question, 'Do you take antihypertensive medication as instructed?'. The answer was a binary variable defining 'No' as 1, 'Yes' as 0.

Independent variable

We used self-reported wealth, educational attainment and current employment status as SES for independent variables. As for wealth, we calculated the wealth index from household asset items following the previous report.[31] Principal component analysis was performed using the possession of the items, for example, radio, black and white television, colour television, video/Digital Versatile Disc (DVD) player, electric fan, refrigerator, computer, store-bought furniture, personal music player, washing machine, gas cooker, electric cooker or rice cooker, air conditioner, bicycle, motorcycle, van/truck, microwave oven, mobile telephone, and internet. The calculated score was categorised into tertiles in each area (high, middle, low). Education was categorised as 'middle/high school or higher', 'some/all primary school', 'monastic' and 'no school', following the educational context in Myanmar. Current employment status was divided into three groups such as 'employed', 'retired' and 'never'.

Covariates

Potential confounding factors included age, sex, marital status and hypertension complications. Marital status was categorised as 'married', 'widowed', 'divorced' and 'never married'. Renal disease, stroke, retinopathy and CVDs were defined as hypertension complications. Those who had one or more complications were categorised as 'Yes', those with no complications as 'No', and those who did not know whether they had complications or not as 'Do not know'.

Statistical analysis

Poisson regression modelling was performed to estimate prevalence ratios (PRs) and 95% CIs. We defined those who lived in Yangon as urban residents and those in Bago as rural residents. Model 1 assessed the association between the wealth category and adherence by adjusting for demographic factors such as age, sex, marital status and hypertension complication. Model 2 was adjusted for educational attainment and other covariates. In Model 3, current employment status and other covariates were adjusted. In the final Model 4, all three SES factors were mutually adjusted. The same analysis was performed for the Yangon and Bago populations. The value of p for trend was also evaluated if the association showed a dose-response relation. All study participants answered all questions. Thus, there were no missing values for the used data. Analysis was conducted using Stata/SE V.17 (StataCorp, College Station, Texas, USA).

Patient and public involvement

None.

RESULTS

The overall characteristics of the study participants are shown in table 1. Among the sample, 61.7% of Yangon residents and 56.3% of Bago residents had hypertension (p=0.06). The non-adherence rates were 21.5% in Yangon and 48.4% in Bago (p<0.001). Material wealth was divided into tertiles based on their respective distributions in urban and rural areas. For education attainment, 52.1% of Yangon and 14.5% of Bago residents had 'middle/high school' level of higher education (p<0.001). For employment status, 14.8% of Yangon and 26.6% of Bago residents were 'employed' (p<0.001, table 1).

Table 2 shows the association between SES and non-adherence in Yangon. In the urban population, wealth was significantly associated with non-adherence (Model 1); that is, PR of 'Low' was 2.39 (95% CI 1.16 to 4.93), and the PR of 'Middle' was 2.99 (95% CI 1.48 to 6.05) compared with 'High'. After mutual adjustment of the three types of SES, the association remained. Educational attainment was marginally significantly associated with non-adherence in 'Primary school' and 'Monastic'. The association was dose-response according to p for trend (p=0.049) in Model 2, but after adjusting all three types of SES, the trend disappeared. Current employment status was not significantly associated.

Table 3 shows the result of the same analysis as in table 2 in Bago. In the rural population, only educational attainment showed a significant relationship with non-adherence. PR of 'No school', 'Monastic' and 'Primary school' was 3.06 (95% CI 1.32 to 7.09), 2.32 (95% CI 1.11 to 4.84) and 2.31 (95% CI 1.13 to 4.72),

Table 1 Characteristics of the participants

Region	All	Yangon	Bago	P value*
Overall participants (n=1200)	1200	600	600	
Hypertension				
Yes	708 (59.0%)	370 (61.7%)	338 (56.3%)	0.06
No	492 (41.0%)	230 (38.3%)	262 (43.7%)	
Study participants	573	317	256	
Taking hypertension medications				
As instructed	381 (66.5%)	249 (78.5%)	132 (51.6%)	<0.001
Not as instructed	192 (33.5%)	68 (21.5%)	124 (48.4%)	
Age group, years				
60–64	169 (29.5%)	94 (29.7%)	75 (29.3%)	0.89
65–69	142 (24.8%)	79 (24.9%)	63 (24.6%)	
70–74	117 (20.4%)	65 (20.5%)	52 (20.3%)	
75–79	75 (13.1%)	44 (13.9%)	31 (12.1%)	
80+	70 (12.2%)	35 (11.0%)	35 (13.7%)	
Sex				
Male	196 (34.2%)	106 (33.4%)	90 (35.2%)	0.67
Female	377 (65.8%)	211 (66.6%)	166 (64.8%)	
Marital status				
Married	290 (50.6%)	160 (50.5%)	130 (50.8%)	0.85
Widowed	246 (42.9%)	134 (42.3%)	112 (43.8%)	
Divorced	5 (0.9%)	3 (0.9%)	2 (0.8%)	
Never married	32 (5.6%)	20 (6.3%)	12 (4.7%)	
Hypertension complications (one or more: yes, none: no)				
No	324 (56.5%)	182 (57.4%)	142 (55.5%)	0.03
Yes	157 (27.4%)	95 (30.0%)	62 (24.2%)	
Do not know	92 (16.1%)	40 (12.6%)	52 (20.3%)	
Wealth index category				
Low	198 (34.6%)	112 (35.3%)	86 (33.6%)	0.75
Middle	183 (31.9%)	97 (30.6%)	86 (33.4%)	
High	192 (33.5%)	108 (34.1%)	84 (32.8%)	
Educational attainment				
No school	50 (8.7%)	23 (7.3%)	27 (10.5%)	<0.001
Monastic	132 (23.0%)	46 (14.5%)	86 (33.6%)	
Some/all primary school	189 (33.0%)	83 (26.2%)	106 (41.4%)	
Middle/high school or higher	202 (35.3%)	165 (52.1%)	37 (14.5%)	
Employment status				
Employed	115 (20.1%)	47 (14.8%)	68 (26.6%)	<0.001
Retired	409 (71.4%)	223 (70.3%)	186 (72.7%)	
Never	49 (8.6%)	47 (14.8%)	2 (0.8%)	

*χ^2 test

respectively. Even after mutually adjusting for the other two SES factors, the association clearly appeared. The association seemed dose-response and p for trend was also significant both before and after mutually adjusting all SES types (Model 2 and Model 4). With regards to wealth, although the association itself was not statistically significant, the direction of the association was the opposite compared with urban areas. Current employment

Table 2 Prevalence ratios (95% CIs) of *not* taking medicines as instructed in Yangon (n=317)

	Model 1	Model 2	Model 3	Model 4
Wealth index category				
Low	**2.39 (1.16–4.93)***			2.04 (0.94–4.42)
Middle	**2.99 (1.48–6.05)****			**2.68 (1.28–5.59)****
High	1 (referent)			1 (referent)
Educational attainment				
No school		1.98 (0.75–5.21)		1.63 (0.59–4.46)
Monastic		1.80 (0.91–3.59)		1.38 (0.67–2.83)
Primary school		1.71 (0.94–3.11)		1.40 (0.76–2.60)
Middle/high school or higher		1 (referent)		1 (referent)
Trend p		0.049		0.264
Current employment status				
Never			0.48 (0.18–1.25)	0.57 (0.31–1.07)
Retired			0.62 (0.34–1.16)	0.52 (0.19–1.38)
Employed			1 (referent)	1 (referent)

Model 1 was adjusted for wealth index, age, sex, marital status and hypertension complication.
Model 2 was adjusted for educational attainment, age, sex, marital status and hypertension complication.
Model 3 was adjusted for current employment status, age, sex, marital status and hypertension complication.
Model 4 was mutually adjusted for wealth index, educational attainment, current employment status and other covariates.
* p<0.05
** p<0.01

Table 3 Prevalence ratios (95% CIs) of *not* taking medicines as instructed in Bago (n=256)

	Model 1	Model 2	Model 3	Model 4
Wealth index category				
Low	0.92 (0.58–1.44)			0.80 (0.50–1.27)
Middle	0.86 (0.56–1.32)			0.79 (0.51–1.22)
High	1 (referent)			1 (referent)
Educational attainment				
No school		**3.06 (1.32–7.09)****		**3.22 (1.37–7.58)****
Monastic		**2.32 (1.11–4.84)***		**2.42 (1.16–5.07)***
Primary school		**2.31 (1.13–4.72)***		**2.41 (1.18–4.95)***
Middle/high school or higher		1 (referent)		1 (referent)
Trend p		0.024		0.021
Current employment status				
Never			0.94 (0.13–7.08)	1.30 (0.17–10.03)
Retired			0.83 (0.52–1.32)	0.86 (0.54–1.38)
Employed			1 (referent)	1 (referent)

Model 1 was adjusted for wealth index, age, sex, marital status and hypertension complication.
Model 2 was adjusted for educational attainment, age, sex, marital status and hypertension complication.
Model 3 was adjusted for current employment status, age, sex, marital status and hypertension complication.
Model 4 was mutually adjusted for wealth index, educational attainment, current employment status and other covariates.
* p<0.05
** p<0.01

status had no significant relation in the rural areas as well.

DISCUSSION

The present study elucidated some aspects of the association between the area of residence and hypertension adherence among the older population in Myanmar. The results of the study indicated three things. First, in Myanmar, living in rural areas was associated with poor hypertension adherence. Second, stratified analysis showed that low wealth was significantly associated with poor adherence only in urban areas, indicating that the association's direction may be opposite in urban and rural areas. Finally, low educational attainment was associated with poor adherence in rural areas and marginally associated in urban areas. Current employment status was not associated.

The study results showed that adherence is dependent on whether a person lives in an urban or rural area. In previous studies in LMICs, the incidence of hypertension was higher in urban areas, with mixed results for poor adherence.[8 9 21 22] Previous studies have also found that adherence disparities among urban and rural residents were higher in low-income countries than in high-income countries.[13] In Myanmar, the magnitude was almost twice as high (non-adherence rate: 21.5% in Yangon vs 48.4% in Bago). In terms of direction, it was also found that adherence was poorer in rural areas than in urban areas. For example, in China, the same LMIC studies have shown that risk factors for hypertension differ between urban and rural areas.[32] The present results may suggest that there is more room for intervention in rural areas than in urban areas in Myanmar.

In urban Yangon, people in the moderate or low-wealth category had poorer adherence than those in the high-wealth category. Educational background was not as strongly associated as in rural areas. As wealth is strongly related to income, a possible explanation for the association of wealth with adherence in urban areas is the disparity in access to healthcare facilities related to income. There is a wide range of healthcare facilities in urban areas, including the public and private sectors. In the context of LMICs, such as Myanmar, while there is free access to public healthcare facilities, there is no option for choice of medicines coupled with very long waiting times. Also, in urban areas, private healthcare facilities provide an attractive working environment for healthcare professionals. That leads to the low number of healthcare professionals in public hospitals relative to the number of patients,[33] and this may be partly related to the situation in which those with low incomes are more likely to drop out, as it takes more time and effort to receive medication for high blood pressure.[34] This situation may also allow the affluent to secure their medications easily, as they can visit private healthcare facilities with a wide choice of medications and with shorter waiting times.

One possible explanation for why educational attainment was not as strongly associated with adherence in the urban areas as in the rural areas is that adherence may be mainly sustained independent of education in urban areas. This is so since information on the chronic nature of hypertension, the importance of regular oral medication, and the fear of complications of hypertension could be routinely received from the media and other sources.

Educational attainment was associated with adherence in rural areas but not wealth or current working status. Several explanations could be raised. First, access to medication could be easier in rural areas than in urban areas in some LMIC contexts. Considering income is one of the determinants of wealth, a reason for this phenomenon is that access to medications is less determined by wealth in rural areas than in urban areas due to support from Non-Governmental Organizations (NGOs) and other organisations. Since rural areas do not have as many options for healthcare facilities as urban areas, public hospitals usually cover patients' prescriptions. That may allow people living in rural areas to have relatively easier access to obtain medications. In contrast, the fact that adherence itself is lower in rural areas than in urban areas may be related to the unstable supply of drugs in rural areas. Second, in rural areas, determinants of adherence may, therefore, purely be education-related factors, such as understanding lowering blood pressure and following instructions from healthcare providers.[35] Third, it is also possible that self-control ability could explain the association between education and adherence, with the latter requiring patience.[36] Since self-control depends on educational attainment,[36 37] the dose-response relationship between educational attainment and adherence could be observed.

However, in rural China, educational history was not associated with adherence,[11] but low household income was associated with poor adherence. That may indicate that even in countries with the same income level, the factors creating the urban-rural adherence gap may differ by region. Lastly, since an association between low educational attainment and poor adherence was found even in urban areas, education generally influenced an individual's adherence status regardless of living place.

The limitations of this study should be mentioned. First, a relatively low participation rate could be pointed out. Since our survey was conducted in the daytime, older people working during the day were less likely to be at home. However, the response rate was almost the same between the urban and rural areas in the study (55.5% vs 57.5%), so it could be assumed that regional differences were unlikely to be affected by the response rate. Second, with regard to the calculation of wealth, rural assets may not be accurately reflected, as some items that may be relevant to rural asset status, such as the presence of livestock, were not included in the survey instrument. However, as tertiles were calculated for each region, the gradations of asset status could be extracted to some extent. Also, in online supplemental appendix 1, 92.7%

of study respondents selected 'I only take them when I feel that I need them' as the reason. For the question, 94.1% of the Yangon non-adherent group and 91.9% of the non-adherent group in Bago ticked 'Yes' (p=0.578). The cost or the availability of hypertension medication was not the main reason. Third, as a measure of adherence, scores such as the 8-item Morisky Medication Adherence Scale (MMAS-8)[38 39] could not be used in the study, so adherence-related factors such as the complexity of medication and satisfaction with care at the healthcare organisation were not taken into account.

CONCLUSIONS

Our analysis indicates that the risk of poor adherence is higher in rural areas than in urban areas in Myanmar. As for intervening SES, educational attainment was associated with non-adherence in both urban and rural areas. Wealth was only associated with adherence in urban areas. The factors associated with maintaining adherence differ depending on the country's urban-rural context. Therefore, effective interventions for each area need to be considered.

Author affiliations
[1]Department of Global Health Promotion, Tokyo Medical and Dental University, Bunkyo-ku, Japan
[2]Department of Social Preventive Medical Sciences, Chiba University Center for Preventive Medical Sciences, Chiba, Japan
[3]Department of Active Ageing, Niigata University, Niigata, Japan
[4]Department of International Health and Collaboration, National Institute of Public Health, Wako, Japan
[5]Department of Health and Social Behavior, The University of Tokyo, Bunkyo-ku, Japan
[6]Bureau of International Health Cooperation, National Center for Global Health and Medicine, Tokyo, Japan
[7]Department of Preventive and Social Medicine, University of Medicine, Magway, Myanmar
[8]Department of Preventive and Social Medicine, University of Medicine 1, Yangon, Yangon, Myanmar

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Contributors YN established the research question, analysed the data and drafted the manuscript. YugoS is the guarantor of the study and assumed all responsibility for the survey and research as the principal investigator of the project. HHW was the principal investigator in Myanmar. TF and YPK intensively edited the paper. KTL, PEZ and TZB performed data collection, questionnaire development and survey management. YuriS, YukiS, IN and DT contributed to developing the questionnaire and the study design and intensively edited the manuscript.

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Competing interests None declared.

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Patient consent for publication Not applicable.

Ethics approval This study involves human participants. The ethical review committee of the Department of Medical Research at the Ministry of Health and Sports, the Republic of the Union of Myanmar (approval no. Ethics/DMR/2018/038), the WHO ethics committee (protocol no. ERC.0003072), the ethics board of Niigata University (2018－0096), and the National Institute of Public Health in Japan (IBRA#12279) approved the research protocol. At the start of face-to-face questions, written informed consent was obtained from all participants. Participants were informed that participation was voluntary and were assured that they could withdraw from the survey at any time. This study was conducted following the principles of the Declaration of Helsinki. Participants gave informed consent to participate in the study before taking part.

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ORCID iDs
Yuiko Nagamine http://orcid.org/0000-0003-1901-6697
Yugo Shobugawa http://orcid.org/0000-0003-2851-0101
Takeo Fujiwara http://orcid.org/0000-0002-1074-3954

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