Nozaki et al. 
Health Research Policy and Systems 2022, 20(Suppl 1):114
https://doi.org/10.1186/s12961-022-00918-y

RESEARCH

Open Access

Unmet needs for hypertension diagnosis among older adults in Myanmar: secondary analysis of a multistage sampling study

Ikuma Nozaki1*, Yugo Shobugawa2, Yuri Sasaki3, Daisuke Takagi4, Yuiko Nagamine5, Poe Ei Zin6, Thae Zarchi Bo6, Than Win Nyunt7, Min Zaw Oo6, Kay Thi Lwin6 and Hla Hla Win6,8

Abstract

Background: Hypertension is a major cause of morbidity among older adults. We investigated older adults’ access to health services in Myanmar by focusing on unmet needs in diagnosing hypertension. This study aims to identify factors associated with the unmet needs for hypertension diagnosis in the study areas of Myanmar.

Methods: This is a secondary data analysis of the survey which is a cross-sectional study conducted with older adults (aged ≥ 60 years) in the Yangon and Bago regions of Myanmar. Objective indicators of health were collected, including blood pressure, height and weight. The diagnosis of hypertension was considered an unmet need when a participant’s blood pressure measurement met the diagnostic criteria for hypertension but the disease had not yet been diagnosed. Bivariate and multivariate analyses using logistic regression were performed to identify factors associated with the unmet need for hypertension diagnosis. Factors related to lifestyle habits and medical-seeking behaviour were selected and put into the multivariate model.

Results: Data from 1200 people, 600 from each of the two regions, were analysed. Altogether 483 (40.3%) participants were male, 530 (44.2%) were aged ≥ 70 years, and 857 were diagnosed with hypertension based on their measured blood pressure or diagnostic history, or both, which is a 71.4% prevalence of hypertension. Moreover, 240 (20.0%) participants had never been diagnosed with hypertension. In the multivariate analysis, these unmet needs for hypertension diagnosis were significantly associated with male sex (odds ratio [OR] 1.46, 95% confidence interval [CI] 1.05–2.05), residence in the Bago region (OR 1.64, 95% CI 1.09–2.45) and better self-rated health (OR 1.70, 95% CI 1.24–2.33), but not with education, category on the wealth index or living arrangement.

Conclusions: There are barriers to accessing health services for hypertension diagnosis, as evidenced by the regional disparities found in this study, and charitable clinics may decrease the financial barrier to this diagnosis.

Keywords: Older adults, Healthcare access, Self-rated health status, Japan Gerontological Evaluation Study (JAGES)

Background

Population ageing in Myanmar has progressed rapidly in recent years as a result of declining fertility and improving survival, similar to changes in other countries in South-East Asia [1]. In 2019, 6% of the population in Myanmar was estimated to be aged ≥ 65 years, which is less than the 7% criterion that determines an ageing society; however, this percentage is estimated to reach 13%
in 2050, which approaches the criterion for an aged society (14%) [2]. Older people tend to have chronic conditions, particularly noncommunicable diseases (NCDs) such as hypertension [3]. A community-based study of older people in urban and rural areas of Myanmar found that 58% of participants had at least one chronic condition in the preceding year and that 33% reported two or more conditions, including hypertension (67%), arthritis (25%), arrhythmia (15%), coronary heart disease (14%) and diabetes (14%) [4]. In Myanmar, due to urbanization, an increasingly westernized lifestyle and economic development, the prevalence of behavioural and metabolic risk factors for NCDs—such as daily smoking, alcohol consumption, unhealthy eating habits, physical inactivity and obesity—have increased, similar to those in other Asian countries that are undergoing rapid economic development [5, 6]. In fact, the number of hospitalizations due to major NCDs in Myanmar increased 2.2-fold in the 6 years from 2012 to 2017, inclusive [7], and in 2014 the proportional mortality rate due to NCDs—such as cardiovascular diseases, cancers, chronic respiratory diseases and diabetes—among all deaths in Myanmar was 59% [8]. In Myanmar, hypertension is one of the commonest NCDs, and it is the leading risk factor for other NCDs, such as cardiovascular diseases and cerebrovascular disease. A nationwide study of 7429 people reported an estimated prevalence of hypertension among individuals aged 15–64 years of 30% and among those aged 55–64 years of 52% [9].

Early diagnosis, lifelong supportive pharmacotherapy and early detection of and effective care for complications are the mainstays of management for averting premature mortality due to the major NCDs [4]. However, the utilization of health services by older adults in Myanmar has not yet been adequately described. This study aimed to examine the unmet needs for hypertension diagnosis and the factors associated with it in urban and rural areas of Myanmar.

Methods

Study design and subject

Our study is a secondary analysis of data from the 2018 survey of healthy and active ageing in Myanmar. Based on the collected data from the 2018 survey, cross-sectional analysis was done. The 2018 survey was conducted using a questionnaire from the Japan Gerontological Evaluation Study (known as JAGES). The survey was a population-based multistage cluster-sample questionnaire survey conducted among community-dwelling older adults in the Yangon and Bago regions from September to December 2018 [10]. In the first stage of the survey, six townships in each region were selected using population-proportionate sampling. Townships constitute third-level administrative divisions in Myanmar, each of which has approximately 100 000 inhabitants. Townships comprise wards in urban areas and village tracts in rural areas. Consequently, 10 wards and 10 village tracts from selected townships in Yangon and Bago were chosen by population-proportionate random sampling. Finally, 10 eligible individuals aged ≥ 60 years were randomly selected from the list of older residents available in the ward or village-tract office, and they were invited to participate in the survey. Individuals were excluded if they were bedridden or had severe dementia, defined as an Abbreviated Mental Test score of ≤ 6 [11, 12]. The study recruitment process continued until the prespecified number of eligible participants in the study protocol was reached.

Data collection

For collecting data in 2018 survey, after obtaining written informed consent, participants were interviewed in person by trained interviewers using a paper-based semi-structured questionnaire. The questionnaire was adapted from the JAGES questionnaire [13]—which encompasses health, psychological and functional factors, and social determinants of health—to the context in Myanmar; the survey was translated into the local language. Objective measurements were made during the home visit and included the participant’s body weight, height, body composition, abdominal circumference, blood pressure and grip strength. Before the survey began, interviewers were trained to use an automated sphygmomanometer (BC-757, TANITA Corporation, Tokyo, Japan) and measured blood pressure with it during the home visit. All data were double-entered in an Excel database, and discrepancies were checked against the raw data.

Data analysis

Data were analysed with Stata/MP version 16 (Stata Corporation, College Station, TX, USA). The primary analysis calculated the unmet need for hypertension diagnosis, which was defined as occurring when the measured blood pressure was above the diagnostic criterion for hypertension, but the individual had not yet been diagnosed. Hypertension was diagnosed when for the average of two measurements systolic pressure was ≥ 140 mmHg or diastolic pressure was ≥ 90 mmHg, or both. To describe the consequences of a diagnosis of hypertension, we calculated the number of participants who had access to any kind of treatment and the number of participants who could achieve blood pressure control. The wealth index was used as an economic indicator, and participants were categorized into one of three groups—rich (20%), middle class (40%) or poor (40%)—based on an assessment of household assets using a
previously reported method [14]. To identify the factors associated with the unmet need for hypertension diagnosis, bivariate analysis using a logistic regression model was conducted by including the following variables: sex, age group, residential area, educational level, marital status, category on the wealth index, whether the participant was living with a relative, and smoking, eating, and walking habits. Sex, region, category in the wealth index, smoking, walking, and self-rated health status were found to be significant in the bivariate analysis were included in the multivariate analysis (Model 1). We inferred that living with a relative might affect the participant’s access to health services and, therefore, this item was also included in the analysis as living with a spouse (Model 2), living with a daughter (Model 3) and living with a son (Model 4), even if it was not found to be significant in the bivariate analysis. All analyses also considered survey weighting to avoid sampling bias and to better describe the representativeness of the older population in each region. Survey weight was calculated to divide by population at township level. All analyses were conducted with the significance level set at 0.05.

Ethics approval
This research project was approved by the Ethics Review Committee of the Department of Medical Research, Myanmar Ministry of Health and Sports (approval no. Ethics/DMR/2018/038); the Research Ethics Review Committee of the World Health Organization (protocol no. ERC.0003072); and the Ethics Board of Niigata University (Approval No. 2018-0096).

Results
Characteristics of participants in the survey
In total, 1200 older adults participated in this study, including 600 from the Yangon region (222 men and 378 women) and 600 from the Bago region (261 men and 339 women). Participation rate was 98.4% in Yangon and 86.5% in Bago. The characteristics of the participants are shown in Table 1. In this study, 670 (55.8%) participants were aged 60–69 years and 530 (44.2%) were aged ≥ 70 years. Age range of the study participants was between 60 and 95 years old. Participants included 387 (32.3%) with middle school or a higher level of education, 558 (46.5%) who were currently unmarried, and 480 (40.1%) and 481 (40.1%) who were categorized as poor and middle class based on the wealth index. Altogether 68 (5.7%) participants were living alone, 664 (55.3%) were living with a spouse, 535 (44.6%) were living with a son, and 707 (58.9%) were living with a daughter. With regard to current lifestyle habits related to health intentions, 288 (24.0%) were smokers, 446 (37.2%) chewed betel, Table 1 Characteristics of participants in study of healthy ageing, Myanmar, 2018

| Characteristics                              | Region | Total (N = 1200) |
|----------------------------------------------|--------|------------------|
|                                              | Yangon | Bago             |
| Sex                                          |        |                  |
| Male                                         | 222    | 261              | 483 |
| Female                                       | 378    | 339              | 717 |
| Age group, years                             |        |                  |
| 60–69                                        | 351    | 319              | 670 |
| ≥ 70                                         | 249    | 281              | 530 |
| Education                                    |        |                  |
| Below primary level                          | 290    | 523              | 813 |
| Middle school or above                       | 310    | 77               | 387 |
| Marital status                               |        |                  |
| Married                                      | 315    | 327              | 642 |
| Unmarried currently                          | 285    | 273              | 558 |
| Wealth index                                 |        |                  |
| Poor                                         | 64     | 416              | 480 |
| Middle class                                 | 305    | 176              | 481 |
| Rich                                         | 230    | 7                | 237 |
| Living with spouse                           |        |                  |
| Yes                                          | 299    | 365              | 664 |
| No                                           | 301    | 235              | 536 |
| Living with son                              |        |                  |
| Yes                                          | 278    | 257              | 535 |
| No                                           | 322    | 343              | 665 |
| Living with daughter                         |        |                  |
| Yes                                          | 382    | 325              | 707 |
| No                                           | 218    | 275              | 493 |
| Living alone                                 |        |                  |
| Yes                                          | 23     | 45               | 68  |
| No                                           | 577    | 555              | 1,132 |
| Alcohol drinking                             |        |                  |
| Teetotaller                                   | 506    | 446              | 952 |
| Ever drank                                   | 94     | 154              | 248 |
| Smoking                                      |        |                  |
| Nonsmoker currently                          | 502    | 410              | 912 |
| Smoker                                       | 98     | 190              | 288 |
| Betel chewing                                |        |                  |
| No                                           | 434    | 320              | 754 |
| Yes                                          | 166    | 280              | 446 |
| Consumes fruits and vegetables                |        |                  |
| Daily                                        | 397    | 418              | 815 |
| Less than daily                              | 203    | 182              | 385 |
| Daily walking                                |        |                  |
| ≥ 1 hour                                     | 163    | 198              | 361 |
| < 1 hour                                     | 437    | 402              | 839 |
| Body mass index (kg/m²)                      |        |                  |
| Underweight (< 18.5)                         | 85     | 237              | 322 |
| Normal (18.5–25)                             | 275    | 273              | 548 |
| Overweight (≥ 25)                            | 240    | 90               | 330 |
815 (67.9%) ate vegetables or fruits daily, and 361 (30.1%) walked for ≥ 1 hour every day.

**Unmet need for hypertension diagnosis**

There were 551 (45.9%) normotensive participants and 649 (54.1%) hypertensive participants (defined as an average of two blood pressure measurements of ≥ 140/90 mmHg), of whom 553 (46.1%) had never been diagnosed with hypertension in a medical setting. The measured blood pressure values of 649 (54.1%) participants met the diagnostic criteria for hypertension. Adding the 208 participants with normal blood pressure measurements but a history of being diagnosed with hypertension, 857 participants were categorized as hypertensive based on their measured blood pressure or diagnostic history, a crude prevalence of 71.4% (857/1200). The estimated prevalence calculated by weighted value was 71.6% (95% confidence interval [CI]: 68.7% to 74.4%). Among those 857 participants, 617 (crude prevalence: 72.0%) had been diagnosed with hypertension and 571 (crude prevalence: 66.6%) had access to some kind of treatment, including traditional medicine. The corresponding estimated values analysed by weighted sample were 73.7% (95% CI: 70.5% to 76.7%) and 68.4% (95% CI: 64.5% to 72.2%), respectively. However, the measured blood pressure of only 186 participants (crude prevalence: 32.6%; prevalence estimated by weighted sample: 32.8%; 95% CI: 28.0% to 37.6%) was controlled in the normotensive range (data not shown).

**Factors associated with the unmet need**

In our primary analysis of the unmet need for hypertension diagnosis, the measured blood pressure of 240/1200 participants (crude prevalence: 20.0%; estimated prevalence by weighted sample: 18.8%; 95% CI: 16.6% to 21.1%) was above the diagnostic criterion for hypertension, although they had never been diagnosed. The bivariate analysis of the factors associated with the unmet need for hypertension diagnosis showed that the following characteristics were significant (Table 2): male sex (odds ratio [OR]: 1.69; 95% CI: 1.24 to 2.31), residence in the Bago region (OR: 1.77; 95% CI: 1.31 to 2.39), being categorized as poor or rich compared to middle class on the wealth index (OR: 1.23; 95% CI: 0.92 to 1.64 and OR: 0.62; 95% CI: 0.40 to 0.96), being a smoker (OR: 1.54; 95% CI: 1.15 to 2.06), walking for ≥ 1 hour every day (OR: 1.48; 95% CI: 1.10 to 1.99) and having excellent or good self-rated health (OR: 1.62; 95% CI: 1.24 to 2.12). The multivariate analysis was adjusted for sex, region, category in the wealth index, smoking, walking and self-rated health status, as these variables were found to be significant in the bivariate analysis. The results showed that male sex (OR: 1.46; 95% CI: 1.04 to 2.03), residence in the Bago region (OR: 1.76; 95% CI: 1.15 to 2.69) and having excellent or good self-rated health (OR: 1.62; 95% CI: 1.24 to 2.12) remained significant (Table 3, Model 1). The results of the analyses that included living with a relative are shown in Models 2, 3 and 4 in Table 3. On multivariate analysis, we found that living with a relative was not a significant factor affecting the unmet need for hypertension diagnosis.

**Discussion**

**Prevalence of hypertension in older adults in Myanmar**

This study estimated a 71% prevalence of hypertension among participants aged ≥ 60 years based on their diagnostic history (51%), blood pressure measured at the home visit (46%), or both. This prevalence is slightly higher than that of 67.3% reported for hypertension in a study that was conducted in 2016 in Bago and Mon states among adult participants aged ≥ 60 years [4]. Although that study was conducted among participants of different age groups at different study sites, other reports estimated the prevalence of hypertension to be 30.1% among adults aged 15–64 years in Myanmar in 2007 [9] and 51% among adults aged 40–99 years in the Mon state, and the Ayeyarwaddy and Bago regions in 2017 [15]. As the prevalence of hypertension often increases with age, it seems natural that the prevalence would differ among age groups.
| Characteristics                      | Unmet need for hypertension diagnosis | Odds ratio (95% CI) |
|--------------------------------------|--------------------------------------|--------------------|
|                                      | Undiagnosed hypertension | Normotensive or diagnosed hypertension |
| Sex                                  |                                      |                    |
| Male                                 | 122                                  | 361                | 1.69 (1.24 to 2.31) |
| Female                               | 118                                  | 599                | Ref.                |
| Age group, years                     |                                      |                    |
| 60–69                                | 127                                  | 543                | 0.84 (0.62 to 1.13) |
| ≥ 70                                 | 113                                  | 417                | Ref.                |
| Residence                            |                                      |                    |
| Yangon                               | 94                                   | 506                | Ref.                |
| Bago                                 | 146                                  | 454                | 1.77 (1.31 to 2.39) |
| Education                            |                                      |                    |
| Below primary level                  | 173                                  | 640                | 1.22 (0.89 to 1.69) |
| Middle school or above               | 67                                   | 320                | Ref.                |
| Marital status                       |                                      |                    |
| Married                              | 135                                  | 507                | 1.12 (0.83 to 1.51) |
| Unmarried currently                  | 105                                  | 453                | Ref.                |
| Wealth index                         |                                      |                    |
| Poor                                 | 110                                  | 370                | 1.23 (0.92 to 1.64) |
| Middle class                         | 98                                   | 383                | Ref.                |
| Rich                                 | 32                                   | 205                | 0.62 (0.40 to 0.96) |
| Living with spouse                   |                                      |                    |
| Yes                                  | 140                                  | 524                | 1.14 (0.83 to 1.55) |
| No                                   | 100                                  | 436                | Ref.                |
| Living with son                      |                                      |                    |
| Yes                                  | 99                                   | 436                | 0.79 (0.57 to 1.09) |
| No                                   | 141                                  | 524                | Ref.                |
| Living with daughter                 |                                      |                    |
| Yes                                  | 140                                  | 567                | 0.93 (0.70 to 1.24) |
| No                                   | 100                                  | 393                | Ref.                |
| Living alone                         |                                      |                    |
| Yes                                  | 12                                   | 56                 | 1.05 (0.55 to 2.01) |
| No                                   | 228                                  | 904                | Ref.                |
| Alcohol drinking                     |                                      |                    |
| Teetotaller                          | 179                                  | 773                | 0.70 (0.48 to 1.00) |
| Ever drank                           | 61                                   | 187                | Ref.                |
| Smoking                              |                                      |                    |
| Nonsmoker currently                  | 165                                  | 747                | Ref.                |
| Smoker                               | 75                                   | 213                | 1.54 (1.15 to 2.06) |
| Consumes fruits and vegetables       |                                      |                    |
| Daily                                | 173                                  | 642                | 1.38 (0.97 to 1.95) |
| Less than daily                      | 67                                   | 318                | Ref.                |
| Daily walking                        |                                      |                    |
| ≥ 1 hour                             | 88                                   | 273                | 1.48 (1.10 to 1.99) |
| < 1 hour                             | 152                                  | 687                | Ref.                |
| Body mass index (kg/m²)              |                                      |                    |
| Underweight or normal (< 25)         | 88                                   | 273                | 1.13 (0.80 to 1.59) |
| Overweight (≥ 25)                    | 152                                  | 687                | Ref.                |
| Social participation                 |                                      |                    |
Table 2  (continued)

| Characteristics          | Unmet need for hypertension diagnosis | Odds ratio (95% CI) |
|--------------------------|--------------------------------------|--------------------|
|                          | Undiagnosed hypertension             | Normotensive or diagnosed hypertension |
| No                       | 212                                  | 829                | 1.19 (0.77 to 1.82) |
| Yes                      | 28                                   | 131                | Ref.                |
| Social cohesion          |                                      |                    |                     |
| Less                     | 71                                   | 297                | 0.90 (0.64 to 1.26) |
| Much                     | 169                                  | 663                | Ref.                |
| Social support           |                                      |                    |                     |
| Less                     | 76                                   | 320                | 0.94 (0.66 to 1.34) |
| Much                     | 164                                  | 640                | Ref.                |
| Self-rated health        |                                      |                    |                     |
| Fair or poor             | 148                                  | 698                | Ref.                |
| Excellent or good        | 92                                   | 262                | 1.62 (1.24 to 2.12) |

CI confidence interval, Ref. reference category

Table 3  Multivariate analysis for the unmet need for hypertension diagnosis, Myanmar

| Characteristics          | Adjusted odds ratio (95% CI) |
|--------------------------|-------------------------------|
|                          | Model 1                       | Model 2               | Model 3               | Model 4               |
| Sex                      |                               |                       |                       |                       |
| Male                     | 1.46 (1.04 to 2.03)           | 1.54 (1.05 to 2.27)   | 1.46 (1.05 to 2.03)   | 1.46 (1.05 to 2.04)   |
| Female                   | Ref.                          | Ref.                  | Ref.                  | Ref.                  |
| Residence                |                               |                       |                       |                       |
| Yangon                   | Ref.                          | Ref.                  | Ref.                  | Ref.                  |
| Bago                     | 1.76 (1.15 to 2.69)           | 1.78 (1.17 to 2.73)   | 1.76 (1.15 to 2.70)   | 1.74 (1.13 to 2.66)   |
| Wealth index             |                               |                       |                       |                       |
| Poor                     | 0.93 (0.63 to 1.36)           | 0.93 (0.63 to 1.36)   | 0.93 (0.63 to 1.37)   | 0.92 (0.63 to 1.35)   |
| Middle class             | Ref.                          | Ref.                  | Ref.                  | Ref.                  |
| Rich                     | 0.71 (0.45 to 1.13)           | 0.72 (0.45 to 1.14)   | 0.71 (0.45 to 1.12)   | 0.69 (0.44 to 1.10)   |
| Smoking                  |                               |                       |                       |                       |
| Nonsmoker currently      | Ref.                          | Ref.                  | Ref.                  | Ref.                  |
| Smoker                   | 1.21 (0.90 to 1.62)           | 1.21 (0.89 to 1.63)   | 1.20 (0.89 to 1.63)   | 1.19 (0.88 to 1.61)   |
| Daily walking            |                               |                       |                       |                       |
| ≥1 hour                  | 1.26 (0.93 to 1.73)           | 1.29 (0.94 to 1.77)   | 1.28 (0.93 to 1.75)   | 1.27 (0.93 to 1.74)   |
| <1 hour                  | Ref.                          | Ref.                  | Ref.                  | Ref.                  |
| Self-rated health        |                               |                       |                       |                       |
| Fair or poor             | Ref.                          | Ref.                  | Ref.                  | Ref.                  |
| Excellent or good        | 1.70 (1.24 to 2.33)           | 1.71 (1.25 to 2.34)   | 1.70 (1.24 to 2.33)   | 1.73 (1.26 to 2.36)   |
| Living with spouse       |                               |                       |                       |                       |
| Yes                      | Ref.                          |                       |                       |                       |
| No                       | 1.18 (0.81 to 1.71)           |                       |                       |                       |
| Living with daughter     |                               |                       |                       |                       |
| Yes                      |                               |                       |                       |                       |
| No                       |                               |                       |                       | 0.96 (0.71 to 1.29)   |
| Living with son          |                               |                       |                       |                       |
| Yes                      |                               |                       |                       |                       |
| No                       |                               |                       |                       | 1.30 (0.93 to 1.83)   |

CI confidence interval, Ref. reference category
groups in the studies. Importantly, Htet et al. reported a significant increase in the age-standardized prevalence of hypertension, from 26.7% in 2004 to 34.6% in 2014, from the results of two cross-sectional studies among 25–74-year-old adults in the Yangon region [16]. Those results suggested an increasing need for programmes to control hypertension.

**Health service coverage**

Berry et al. proposed a hypertension care cascade by subcategorizing the population with hypertension as follows: unscreened and undiagnosed, screened but undiagnosed, diagnosed but untreated, treated but uncontrolled, and treated and controlled [17]. As Tanahashi first proposed in 1978, the measurement of service coverage can be categorized in five important stages that successively lead to a desired health intervention: availability coverage (i.e. the people for whom the service is available), accessibility coverage (i.e. the people who can use the service), acceptability coverage (i.e. the people who are willing to use the service), contact coverage (i.e. the people who use the service) and effectiveness coverage (i.e. the people who receive effective care) [18]. This model has been widely used for evaluating the coverage of health services [19–22]. The combination of contact coverage and effective coverage is classified as actual coverage. The model helps us analyse the gaps that need to be bridged to ensure better service coverage.

**Unmet need for diagnosis of hypertension**

In our study, among participants categorized as hypertensive, 74% had been diagnosed with hypertension, 68% had access to some kind of treatment, and 22% had blood pressure controlled in the normotensive range. These results suggest that there is a gap in diagnosis: most of those who are diagnosed can obtain treatment, but their hypertension remains uncontrolled. Moreover, Htet et al. reported that the rates of treatment and control of hypertension did not change from 2004 to 2014, despite the diagnosis of hypertension increasing from 19.4% to 27.8% during that period [16]. Therefore, we defined the unmet need for hypertension diagnosis as the proportion of participants whose blood pressure was above the diagnostic cut-off for hypertension but who had not yet been diagnosed, and we analysed the associated factors.

**Factors associated with unmet need for hypertension diagnosis**

The commonly reported determinants of health-seeking behaviour in older adults are sex, age, education, socioeconomic status, residential area (urban or rural) and registration under the public system to support people’s health, including health insurance [4, 23–26]. In our study, sex, residential area and self-rated health status were associated with the unmet needs for hypertension diagnosis. Although sex is a well-known determinant of health-seeking behaviour, reports vary as to which sex is more likely to seek care. For instance, a study in Bangladesh reported more health-seeking behaviour among males, whereas a report from Brazil found more health-seeking behaviour among females [23, 26]. A study in Myanmar on multimorbidity and health-seeking behaviour among older people reported a higher prevalence of multimorbidity among older women, but it listed only residence in rural areas and out-of-pocket payments as hindering participants from consulting doctors [4]. However, the study reported that older women were more likely to be widowed, separated, divorced or unemployed than older men, suggesting that women might have less access to healthcare. Nonetheless, the results of our study showed that the unmet needs for hypertension diagnosis are more common among males and were not associated with the participants category on the wealth index.

Living in a rural area was strongly associated with an unmet need for hypertension diagnosis, similar to findings in a previous report [4]. This may reflect disparities in access to medical services between urban and rural areas [27]. Self-rated health status was another factor associated with the unmet need for a diagnosis of hypertension. The 29.5% of the study population who categorized their health status as excellent or good was similar to the 33% of the population with a similar health status in a previous study in Myanmar [28]. Furthermore, poor self-reported health is associated with multimorbidity, but not with health-seeking behaviour. Our results suggest that individuals without subjective symptoms and with self-rated health status of excellent or good did not have access to healthcare, and thus, their hypertension was not diagnosed.

Interestingly, the wealth index was not significant in multivariate analysis in our study, whereas many other studies have reported that poverty and medical expenditure are factors that hinder medical access among older adults [4, 23–26]. In our study, 91% of participants who were diagnosed with hypertension had access to some kind of treatment, although only 33% achieved blood pressure control. Latt et al. reported that in Myanmar, many charitable hospitals are run by private-sector agents [27]. This suggests that hypertension could be diagnosed and treatment started at a charitable clinic, thus alleviating financial concerns for patients, although they might not be able to continue treatment due to limited medical resources, such as antihypertensive medicine. To decrease unmet need for hypertension diagnosis and treatment, medical access and sustainable clinic visit should be assured.
Living arrangements are a well-known determinant of health-seeking behaviour among older adults and play a key role in their use of formal and informal care [29, 30]. In Myanmar, adult children or other relatives who look after older people play a major part in caring for older adults [1, 4, 28]. However, in this study, living with a relative was not significant with regard to the unmet need for hypertension diagnosis. A comparative study of the living arrangements and psychological health of older adults in Myanmar, Viet Nam and Thailand showed that living with a child of a culturally preferred sex significantly improved the emotional health of Vietnamese and Thai elders, despite the finding of almost no significant difference in psychological well-being of older adults in Myanmar across various living arrangements [31]. This study highlights the importance of cultural nuances for theories about the nature of the relationship between living arrangements and psychological health in older adults that might extend to their health-seeking behaviour. Moreover, living arrangements in Myanmar have been changing rapidly with economic development, similar to the changes seen in Thailand, where elders are more likely not to live with their children and to receive substantial remittances from children whom they do not live with [32]. Thus, further studies should be considered to identify the influence of cultural nuances on living arrangements and the effects on the health-seeking behaviour of older adults.

Strength and limitation of the study

A strength of our study is the large data set used in the analysis, the population-based design and the use of random sampling, as well as a high participation rate of 85%. However, this study also has several limitations. First, the generalizability of the findings beyond the Yangon and Bago regions of Myanmar is unknown—that is, they may be representative only of these two regions. Myanmar is a multiethnic country that is characterized by different cultures and customs in various regions and states. Second, this analysis adopted a cross-sectional design, and thus, causal relationships between sociodemographic factors and unmet needs for hypertension diagnosis could not be determined. The causal relationship should be investigated in a cohort study to explore potential causality. Third, all data other than the objective measurements made by trained interviewers—including weight, height and blood pressure—were collected through a questionnaire and, therefore, rely on accurate reporting by the participants, conferring a self-report bias. Despite these limitations, this study identified critical and potential factors that influence the unmet need for hypertension diagnosis in older adults in two regions in Myanmar.

Conclusions

We found that the prevalence of hypertension among older adults in the Yangon and Bago regions was 71.6%. Among the hypertensive participants, 72% had been diagnosed previously; 93% of those who had been diagnosed had access to some kind of treatment, including traditional medicine, but only 33% of those who were treated had achieved blood pressure control in the normal range. We categorized the remaining 28% of the study population with hypertension that was undiagnosed (18.8% of participants) as representing the unmet need for hypertension diagnosis, which was significantly associated with male sex, residence in Bago and excellent or good self-rated health, but was not associated significantly with educational level, category on the wealth index and living arrangements.

In conclusion, there are barriers to accessing health services that hinder the diagnosis of hypertension, as evidenced by regional disparities, which charitable clinics may address by reducing the financial barrier to diagnosis. Individuals without subjective symptoms and with excellent or good self-rated health status might have less access to healthcare and, thus, may not be diagnosed with hypertension.

Abbreviations

CI: Confidence interval; JAGES: Japan Gerontological Evaluation Study; NCDs: Noncommunicable diseases; OR: Odds ratio.

Acknowledgements

We would like to thank all study participants and express our gratitude to Saw Thu Nander, Yi Mynt Kyaw and the Myanmar Perfect Research team members who were deeply involved in implementing the project and conducting the survey. We also would like to thank the Japan Gerontological Evaluation Study team, particularly Katsunori Kondo and Tomoko Manabe.

About this supplement

This article has been published as part of Health Research Policy and Systems Volume 20 Supplement 1, 2022: Research to inform health systems’ responses to rapid population ageing. The full contents of the supplement are available online at https://health-policy-systems.biomedcentral.com/articles/supplements/volume-20-supplement-1.

Author contributions

IN, YS (Yugo Shobugawa), YS (Yuri Sasaki), DT, YN, KTL, PEZ, TZB, TWN, MZO and HH-W designed the research, developed the questionnaire and collected the data. IN analysed the data and produced the first draft of the manuscript. All authors approved the final manuscript; and Yuri Sasaki is the guarantor of the data presented in the manuscript. All authors read and approved the final manuscript.

Funding

This research was funded by the Japan Agency for Medical Research and Development (AMED) for the project titled “Development of health equity assessment tool based on social epidemiological survey for older adults in Myanmar and Malaysia” (Grant No. 17984739), a grant-in-aid for scientific research from the Japan Society for the Promotion of Science for the project titled “Differences in social capital influence on depression among older people—a comparative study of three Asian countries” (Grant No. 19K19472), and a grant-in-aid for a Health and Labour Administration Promotion Research Project titled “Study on promotion of active and healthy ageing in ASEAN Project titled “Study on promotion of active and healthy ageing in ASEAN Development (AMED) for the project titled “Development of health equity assessment tool based on social epidemiological survey for older adults in Myanmar and Malaysia” (Grant No. 17984739); a grant-in-aid for scientific research from the Japan Society for the Promotion of Science for the project titled “Differences in social capital influence on depression among older people—a comparative study of three Asian countries” (Grant No. 19K19472); and a grant-in-aid for a Health and Labour Administration Promotion Research Project titled “Study on promotion of active and healthy ageing in ASEAN.
countries” (Grant No. 208A2002). In addition, the World Health Organization Centre for Health Development (WHO Kobe Centre; WKC) funded the study to accelerate universal health coverage in light of population ageing in ASEAN countries for research titled “Development and validation of questionnaire instrument for evaluating the determinants of health status and universal health coverage in older adults in selected populations in Myanmar and Malaysia” (Reference No. K18015).

Availability of data and materials
The data sets generated and analysed for this study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
This research involving human participants is fully compliant with ethical principles, including the provisions of the World Medical Association Declaration of Helsinki (as amended by the 64th General Assembly of the Association in Brazil, October 2013) and with the additional requirements of the country in which the research was carried out. Voluntary informed consent was obtained from the participants or their legal guardians. This research project was approved by the Ethics Review Committee of the Department of Medical Research, Myanmar Ministry of Health and Sports (Approval No. Ethics/Review/2018/038), the research Ethics Review Committee of the World Health Organization (Protocol No. ERC.0003072), and the Ethics Board of Niigata University (Approval No. 2018-0096).

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
1 Bureau of International Health Cooperation, National Center for Global Health and Medicine, 1-21-1 Toyama, Shinjuku-ku, Tokyo, Japan. 2 Graduate School of Medical and Dental Sciences, Niigata University, Niigata, Japan. 3 Department of International Health and Collaboration, National Institute of Public Health, Saitama, Japan. 4 Graduate School of Medicine, The University of Tokyo, Tokyo, Japan. 5 Department of Family Medicine, Tokyo Medical and Dental University, Tokyo, Japan. 6 Department of Preventive and Social Medicine, University of Medicine 1, Yangon, Myanmar. 7 Department of Geriatric Medicine, Yangon General Hospital, Yangon, Myanmar. 8 University of Public Health, Yangon, Myanmar.

Received: 16 September 2022 Accepted: 16 September 2022
Published: 29 November 2022

References
1. Knodel J, Teerawichitchainan B. Aging in Myanmar: Gerontologist. 2017;57:599–605.
2. United Nations Department of Economic and Social Affairs Population Dynamics. World population prospects 2019. https://population.un.org/wpp/Publications/. Accessed 23 Mar 2020.
3. Marengoni A, Angleman S, Melis R, Mangialasche F, Karp A, Garmen A, et al. Aging with multimorbidity: a systematic review of the literature. Ageing Res Rev. 2011;10:439–9.
4. Aye SK, Hlaing HH, Htay SS, Cumming R. Multimorbidity and health-seeking behaviours among older people in Myanmar: a community survey. PLoS ONE. 2019;14:e0219943.
5. Meng Khoo C, Tai ES. Trends in the incidence and mortality of coronary heart disease in Asian Pacific region: the Singapore experience. J Atheroscler Thromb. 2014;21(Suppl 1):S2-8.
6. Yusuf S, Reddy S, Ounpuu S, Anand S. Global burden of cardiovascular diseases: part I: general considerations, the epidemiologic transition, risk factors, and impact of urbanization. Circulation. 2001;104:2746–53.
7. Swe EE, Htet KKK, Theikuk P, Aung LL, Aye LL, Myint T. Increasing trends in admissions due to non-communicable diseases over 2012 to 2017: findings from three large cities in Myanmar. Trop Med Health. 2020;48:24.
8. World Health Organization. Noncommunicable diseases country profiles 2014. Geneva: World Health Organization; 2014.
9. Bjertness MB, Htet AS, Meyer HE, Htike MM, Zaw KK, Ow WM, et al. Prevalence and determinants of hypertension in Myanmar—a nationwide cross-sectional study. BMC Public Health. 2016;16:590.
10. Win HH, Nyunt TW, Lwin KT, Zin PE, Nozaki I, Bo TZ, et al. Cohort profile: healthy and active ageing in Myanmar (JAGES in Myanmar 2018): a prospective population-based cohort study of the long-term care risks and health status of older adults in Myanmar. BMJ Open. 2020;10:e042877.
11. Jitapunkul S, Pailly J, Boahens S. The abbreviated mental test: its use and validity. Age Ageing. 1991;20:332–6.
12. Mackenzie DM, Copp P, Shaw RJ, Goodwin GM. Brief cognitive screening of the elderly: a comparison of the Mini-Mental State Examination (MMSE), Abbreviated Mental Test (AMT) and Mental Status Questionnaire (MSQ). Psychol Med. 1996;26:427–30.
13. Kondo K. Progress in aging epidemiology in Japan: the JAGES project. J Epidemiol. 2016;26:331–6.
14. Filmer D, Pritchett LH. Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. Demography. 2001;38:115–32.
15. Zaw KK, Nwe N, Hlaing SS. Prevalence of cardiovascular morbidities in Myanmar. BMC Res Notes. 2017;10:99.
16. Htet AS, Bjertness MB, Oo WM, Kjøllesdal MK, Sherpa LY, Zaw KK, et al. Changes in prevalence, awareness, treatment and control of hypertension from 2004 to 2014 among 25–74-year-old citizens in the Yangon Region. Myanmar BMJ Public Health. 2017;17:847.
17. Berry KM, Parker WA, Mchiza ZJ, Seewpaul R, Labadanos D, Rosen S, et al. Quantifying unmet need for hypertension care in South Africa through a care cascade: evidence from the SANHANES, 2011–2012. BMJ Glob Health. 2017;2:e000348.
18. Tanahashi T. Health service coverage and its evaluation. Bull World Health Organ. 1978;56:295–303.
19. Sheff MC, Bawah AA, Asuming PO, Kyei P, Kushtar M, Phillips JF, et al. Evaluating health service coverage in Ghana’s Volta Region using a modified Tanahashi model. Glob Health Action. 2020;13:1732664.
20. Dean L, Ozano K, Adekeeye O, Dixon R, Fung EG, Gaypong M, et al. Neglected tropical diseases as a litmus test for universal health coverage? Understanding who is left behind and why in mass drug administration: lessons from four country contexts. PLOS Negl Trop Dis. 2019;13:e0007847.
21. McCallum R, Taagtmeyer M, Orto I, Mreku M, Muturi N, Martineau T, et al. Healthcare equity analysis: applying the Tanahashi model of health service coverage to community health systems following devolution in Kenya. Int J Equity Health. 2019;18:65.
22. Henriksson DK, Fredrikkson M, Waissa P, Salling K, Swartling PS. Bottleneck analysis at district level to illustrate gaps within the district health system in Uganda. Glob Health Action. 2017;10:1327256.
23. Stoppa SR, Cesar CLG, Alves MCGP, Barros MBA, Goldbaum M. Health services utilization to control arterial hypertension and diabetes mellitus in the city of São Paulo. Rev Bras Epidemiol. 2019;22:e190057.
24. Abdulraheem IS. Health needs assessment and determinants of health-seeking behaviour among elderly Nigerians: a house-hold survey. Ann Afr Med. 2007;6:58–63.
25. Patle RA, Khakse GM. Health-seeking behaviour of elderly individuals: a community-based cross-sectional study. Natl Med J India. 2015;28:181–4.
26. Ahmed SM, Tomson G, Petzold M, Kabir ZN. Socioeconomic status overrides age and gender in determining health-seeking behaviour in rural Bangladesh. Bull World Health Organ. 2005;83:109–17.
27. Latt NN, Cho SM, Htun NMV, Saw YH, Myint MNHA, Aoki F, et al. Healthcare seeking behaviour among elderly Nigerians: a household survey. Ann Afr Med. 2007;6:58–63.
28. Knodel J. The situation of older persons in Myanmar: results from the 2012 survey of older persons. Chiang Mai, Thailand, and Yangon, Myanmar. HelpAge International, 2013. http://deependblue.lib.umich.edu/bitstream/2027/42/100343/1/Myanmarreport.pdf. Accessed 2 Apr 2021.
29. Hays JC. Living arrangements and health status in later life: a review of recent literature. Public Health Nurs. 2002;19:136–51.
30. Hu Y, Leonin T, van Hedel K, Myskylja M, Martikainen P. The relationship between living arrangements and higher use of hospital care at middle
and older ages: to what extent do observed and unobserved individual characteristics explain this association. BMC Public Health. 2019;19:1011.

31. Teerawichitchainan B, Pothisiri W, Long GT. How do living arrangements and intergenerational support matter for psychological health of elderly parents? Evidence from Myanmar, Vietnam, and Thailand. Soc Sci Med. 2015;136–137:106–16.

32. Knodel J, Pothisiri W. Intergenerational living arrangements in Myanmar and Thailand: a comparative analysis. J Cross Cult Gerontol. 2015;30:1–20.

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.