



# Influence of Social Determinants of Health on Cardiovascular Risk among Patients with Schizophrenia in Mandalay, Myanmar\*

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## Abstract

**Purpose:** To examine the influence of Social Determinants of Health (SDH) on cardiovascular (CV) risk among patients with schizophrenia.

**Design:** Predictive correlational research.

**Methods:** One hundred and forty-five patients with schizophrenia who were attending the Outpatient Department at Psychiatric Hospital in Mandalay, Myanmar were recruited by convenience sampling. Data were collected using demographic and SDH information, and CV RISK tool. Descriptive statistics and linear regression were used for data analysis.

**Main findings:** The findings revealed that 6.3% of the sample were at risk of cardiovascular disease. Education, income, employment, marital status, family support, antipsychotic drugs, duration of illness, and residence jointly accounted for 18% of the variance explained in CV risk ( $R^2 = .18$ ,  $F_{(8, 136)} = 3.82$ ,  $p < .001$ ). Among these factors, residence, duration of illness, and employment were significant predictors of CV risk ( $\beta = .31$ ,  $p < .001$ ;  $\beta = .22$ ,  $p = .007$ ;  $\beta = .16$ ,  $p = .050$ , respectively).

**Conclusion and recommendations:** This study showed that SDH including residence, illness, and employment were significant predictors of CV risk among patients with schizophrenia. Psychiatric nurses should conduct screening for CV risk at the time of diagnosis of schizophrenia. Supported employment, and behavioral interventions to promote physical activity should be implemented to prevent cardiovascular diseases particularly in patients who were unemployed, had long duration of illness and living in rural areas.

**Keywords:** cardiovascular risk, Myanmar, schizophrenia, social determinants of health

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# อิทธิพลของปัจจัยสังคมกำหนดสุขภาพที่มีต่อความเสี่ยงในการเกิดโรคหัวใจและหลอดเลือดในผู้ป่วยโรคจิตเภท เมืองมณฑลทะเลย์ ประเทศเมียนมาร์\*

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## บทคัดย่อ

**วัตถุประสงค์:** เพื่อศึกษาอิทธิพลของปัจจัยสังคมกำหนดสุขภาพที่มีต่อความเสี่ยงในการเกิดโรคหัวใจและหลอดเลือดในผู้ป่วยโรคจิตเภท

**รูปแบบการวิจัย:** การศึกษาความสัมพันธ์เชิงทำนาย

**วิธีดำเนินการวิจัย:** กลุ่มตัวอย่างมีจำนวนจำนวน 145 ราย เป็นผู้ป่วยโรคจิตเภท คัดเลือกกลุ่มตัวอย่างด้วยวิธีแบบสะดวกจากแผนกผู้ป่วยนอก โรงพยาบาลจิตเวช เมืองมณฑลทะเลย์ ประเทศเมียนมาร์ เก็บข้อมูลโดยใช้แบบสอบถาม 1) ข้อมูลส่วนบุคคลและปัจจัยสังคมกำหนดสุขภาพ 2) แบบประเมิน CV RISK วิเคราะห์ข้อมูลโดยใช้สถิติเชิงพรรณนา และสถิติถดถอยสถิติถดถอยเชิงเส้น

**ผลการวิจัย:** ผลการวิจัยพบว่ากลุ่มตัวอย่างร้อยละ 6.3 มีความเสี่ยงในการเกิดโรคหัวใจและหลอดเลือด ปัจจัยทั้งหมด ได้แก่ ระดับการศึกษา รายได้ การจ้างงาน สถานภาพสมรส การสนับสนุนจากครอบครัว ยารักษาโรคจิต ระยะเวลาการป่วย และที่อยู่อาศัย สามารถร่วมกันอธิบายความแปรปรวนของความเสี่ยงในการเกิดโรคหัวใจและหลอดเลือดได้ร้อยละ 18 ( $R^2 = .18$ ,  $F_{(8, 136)} = 3.82$ ,  $p < .001$ ) ที่อยู่อาศัย ระยะเวลาการป่วย และการจ้างงานเป็นปัจจัยที่มีอิทธิพลต่อการเกิดความเสี่ยงในการเกิดโรคหัวใจและหลอดเลือด ( $\beta = .31$ ,  $p < .001$ ;  $\beta = .22$ ,  $p = .007$ ;  $\beta = .16$ ,  $p = .050$  ตามลำดับ)

**สรุปและข้อเสนอแนะ:** ปัจจัยสังคมกำหนดสุขภาพ ประกอบด้วย ที่อยู่อาศัย ระยะเวลาการป่วย และการจ้างงาน เป็นปัจจัยที่มีอิทธิพลต่อการเกิดความเสี่ยงในการเกิดโรคหัวใจและหลอดเลือดในผู้ป่วยจิตเภท ดังนั้น โรงพยาบาลจิตเวช ควรจัดให้มีระบบการคัดกรองความเสี่ยงในการเกิดโรคหัวใจและหลอดเลือด ตั้งแต่ผู้ป่วยได้รับการวินิจฉัยว่าเป็นโรคจิตเภท และจัดทำโครงการส่งเสริมการจ้างงาน การมีกิจกรรมทางกายเพื่อป้องกันการเกิดโรคหัวใจและหลอดเลือด โดยเฉพาะกับผู้ป่วยจิตเภทที่มีภาวะว่างงาน มีระยะเวลาป่วยนาน และอาศัยอยู่ในชนบท

**คำสำคัญ:** ความเสี่ยงในการเกิดโรคหัวใจและหลอดเลือด ประเทศเมียนมาร์ โรคจิตเภท ปัจจัยสังคมกำหนดสุขภาพ

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## Background and Significance

Life expectancy in patients with severe mental illnesses (SMI) was found to be substantially shorter than in the general population due to greater cardiovascular (CV) risk. The increased premature mortality is the highest in schizophrenia. Cardiovascular disease (CVD) seems to play a major role in cause-specific mortality in people with SMI.<sup>1-3</sup> A meta-analysis of over 3 million patients with SMI showed the prevalence of CVD among patients with schizophrenia was 5.4% in Asia, 9.7% in Europe, 14.6% in North America, and 20.6% in Oceania.<sup>1</sup> As a consequence, patients with schizophrenia and CVD had an increased risk of burden, including symptom exacerbation, higher readmission rate, and higher healthcare costs.<sup>3</sup> Though the disease burden of both SMI and CVD is greater in western countries compared with Asian countries, prevention of CVD in patients with schizophrenia in Asian countries through improvements in levels of risk factors needs more attention.

Several factors could contribute to the risk of CVD among patients with SMI, including antipsychotic use, unhealthy behaviors, barriers to medical care, poor treatment adherence and social deprivation. Atypical antipsychotic drugs also increased the risk of developing metabolic syndrome and cardiovascular adverse events, and the duration of illness was contributing factors to CV risk among patients with SMI.<sup>1,4-5</sup> Unhealthy behaviors, including smoking, sedentary behaviors,

and unhealthy diets, were also found to account for developing CVD among patients with schizophrenia. One case-control study reported that patients with SMI who exercised at less than recommended levels and ate too many portions of calorie intake had a higher risk of developing obesity, diabetes, and CVD.<sup>6</sup> Demographic characteristics, including education, income, employment, marital status, and residence, were found to be associated with developing metabolic syndrome and CV risk among patients with schizophrenia.<sup>5,7-8</sup> Support from family could engage patients in healthy behaviors, including healthy diet consumption, physical activity, and smoking cessation.<sup>9</sup>

Even though patients with schizophrenia are a vulnerable population for developing CVD, inequalities in the access to healthcare services are still observed, in particular concerning CVD.<sup>2</sup> According to the Non-Communicable Diseases (NCDs) country profile by the World Health Organization, CVD was found to be a major cause of death in the Myanmar population.<sup>10</sup> However, there is no evidence identifying the prevalence of CV risk in patients with schizophrenia in Myanmar. Thus, it is interesting to explore the socioeconomic inequalities of CV risk among Myanmar patients with schizophrenia.

The social determinants of health (SDH) framework organized by Healthy People 2020 was used to guide this study.<sup>11-12</sup> SDH is defined as “conditions in which people are born, grow, work, live, and age, and these conditions are shaped by

socioeconomic and political context.” This framework has been developed to help health professionals begin to better understand and address a variety of factors that can influence probability of developing chronic diseases such as CVD, Type 2 Diabetes and cancer.<sup>11-12</sup> This framework structured SDH into five main domains, including economic stability, education, health and health care, social and community context, and neighborhood and built environment.

Regarding economic stability, evidence showed that patients with schizophrenia who were unemployed and had low monthly income were likely to develop metabolic syndrome ( $\chi^2 = 47.5$  and  $\chi^2 = 23.4$ ,  $p < .001$ , respectively).<sup>7</sup> For the education domain, Asaye et al.<sup>7</sup> reported that education was also associated with the prevalence of metabolic syndrome among psychiatric patients ( $\chi^2 = 22.0$ ,  $p < .001$ ). According to the health and health care domain, antipsychotic drugs and duration of illness predisposed to cardiovascular risk among patients with schizophrenia ( $\chi^2 = 5.37$ ,  $p = .02$ ;  $t = 4.35$ ,  $p < .001$ , respectively).<sup>4-5, 8</sup> Concerning social and community context, support from family members was associated with CV risk reduction behaviors, including physical activity and healthy eating diet (OR = 13.84, 95%CI [4.68, 40.94]; OR = 9.47, 95%CI [3.52, 25.46], respectively).<sup>9</sup> Marital status was found to be associated with the prevalence of metabolic syndrome (OR = 2.73, 95%CI [1.41, 5.24],  $p < .05$ ).<sup>8</sup> Residence, as regard to neighborhood and built

environment, was correlated with the prevalence of metabolic syndrome ( $\chi^2 = 14.1$ ,  $p < .001$ ).<sup>7</sup> The findings of these studies support factors, according to SDH framework, that had an influence on CV risk among patients with schizophrenia. In this study, education, income, employment, marital status, family support, antipsychotic drugs, duration of illness, and residence were selected as predicting factors of CV risk for patients with schizophrenia. According to SDH, education was represented as the education domain; employment and income were represented as the economic stability domain; marital status and family support were represented as the social and community context domain; residence was represented as the neighborhood environment domain; antipsychotic drugs and duration of illness were represented as the access to health care domain. This study thus aimed to identify the prevalence of CV risk in Myanmar patients with schizophrenia and examine the factors affecting the risk of CVD among these patients receiving treatment at the psychiatric hospital in Mandalay, Myanmar.

## Objectives

1. To examine the prevalence of patients with schizophrenia who were at risk of cardiovascular diseases.
2. To examine the predictive power of social determinants of health, including education, income, employment, marital status, family support, antipsychotic drugs, duration of illness, and residence, on cardiovascular risk among patients with schizophrenia in Myanmar.

## Objectives

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## Research Questions

1. What was the prevalence of patients with schizophrenia who were at risk of cardiovascular disease?
2. Could social determinants of health, including education, income, employment, marital status, family support, antipsychotic drugs, duration of illness, and residence, predict cardiovascular risk among Myanmar patients with schizophrenia?

## Methodology

This study was a predictive correlational study design.

### Population and Sample

This study was conducted with a convenience sampling method to recruit patients having been diagnosed with schizophrenia spectrum disorders according to ICD-10, F 20-2, or DSM 5 and attending the outpatient department at the psychiatric hospital in Mandalay, Myanmar. A sample size was calculated using G\* power software version (3.1.9.7). A minimal required sample size was 108 determined by power = 0.90, effect size = 0.25, number of predictors = 15, and an  $\alpha$  of .05.<sup>8</sup> The inclusion criteria included

the patients aged ranging from 30-70 years old and during the stable phase of schizophrenia. Stable phase is the period during which psychotic symptoms are less severe. This phase was justified by the medication records indicating that the patients took antipsychotic medications with stable dose for at least six months prior to participation in this study. The patients with intellectual disability and cognitive impairment assessed by psychiatrists using Mental Status Exam within six months were excluded.

### Research Instruments

This study employed two questionnaires to collect data as followed.

1. Demographic and SDH information was comprised of age, sex, marital status, education, employment, monthly family income, family support, and residence. Clinical information included duration of illness, antipsychotic drugs, which were categorized into atypical and typical, dosage of drugs, and time of medication prescription. All information was obtained from both self-reports and from available case records.

In Myanmar, families are responsible for caring for ill members when they live in the same households.<sup>13</sup> In this way, family members are able to share emotional bonding, provide care, and notice any changes in the patient's symptoms, as well as reduce economic strains. In this study, family support was measured by using one item: Are the participants living with caregivers in the same household or living alone?

Residence referred to a home where a person lives in during a particular period of time. Residence was categorized into rural and urban. The quality of urban and rural life is a multi-dimensional composite concept to measure people's living standards and status.<sup>14</sup> In Myanmar, rural inhabitants have lower economic status, lower literacy rate, and lower middle and high school enrollment than urban inhabitants. The quality of housing conditions, access to safe water, and toilet sanitation are poor in rural areas. Health care expenditure and the provision of health care services by the government are low in rural areas, so these conditions hinder rural people from accessing health care. Thus, these composite concepts relate to their well-being of them. In this study, neighborhood and built environment were measured by using one item: Do the participants live in urban or rural area?

2. Cardiovascular Relative Individual Risk (CV RISK): The tool was developed by Zdrenghea, et al.<sup>15</sup> based on the INTERHEART study, a standardized case-control observational study for cardiovascular diseases in 52 countries. This tool is composed of 13 items in total: 6 items are risk factors, including age and gender, hereditary, stress, smoking, hypertension, and obesity; 2 items are protective factors (including physical activity and healthy diet); and the remaining items are laboratory data of blood tests, including HDL, LDL, or total cholesterol, triglycerides, and fasting blood glucose. CV risk can be calculated based on either clinical risk and lab test or only clinical risk.

In this study, CV risk was calculated based on clinical risk which included risk and protective factors. The score was given for 1 point for every risk factor. Regarding the interpretation, the CV RISK test result is expressed as an abstract score, resulting from a deduction of 25% in the case of physical activity and 15% in the case of healthy diet from the number of risk points. The participants were categorized into patients with CVD and without CVD. The resulting points of risk could be compared with optimal risk and with maximal risk based on this categorization.

CV RISK was translated into Burmese language using the forward-backward translation process after receiving permission from the questionnaire developer. Three experts from the Department of Mental Health and the Department of Cardiology judged the validity of the contents of the instrument. The stability of CV RISK was tested with a pilot study of 30 patients who had similar characteristics with the sample and reassessed in those 30 patients after two weeks. According to Pearson correlation analysis, there was a significant association between cardiovascular risk score between two occasions ( $r = .86, p < .001$ ).

### **Ethical Consideration**

Ethical approval for the study was obtained from the Institutional Review Board (IRB) of the Faculty of Nursing, Mahidol University (COA. No.IRB-NS2021/615.0505) and the Ministry of Health and Education, Myanmar. Permission for data

collection was obtained from an authorized person in the setting. Prior to the data collection, the participants were given research information via telephone interview, and oral consent was obtained. The code number system was used, and data were kept confidential.

### Data Collection

Data collection took place from January to February 2022 after obtaining ethical clearance and permission from all concerned sectors. The objectives of the study were explained to in-charge nurses who were working at the outpatient unit of the psychiatric hospital in Mandalay, Myanmar. The nurses assisted the researcher to recruit the patients who met the inclusion criteria and introduced the researcher to the patients and their family. Participants who agreed to participate in the study were given the research information, and oral consent was obtained. The participants were informed of their right to refuse to participate in the study at any time without any effect on their treatment or health care services.

Data were obtained from medical records and phone interview. During the phone interview, if the participants tended to get aggressive, confused, or had disorganized speech while answering the phone, the interview was stopped. The participant's condition was informed to psychiatric nurses at the hospital to further management.

### Data Analysis

The data were analyzed using Statistical Package for the Social Sciences (SPSS) software version 18.<sup>16</sup> Continuous variables were analyzed using mean, standard deviation, and range. Categorical

data were analyzed using frequency and percentage. Spearman and Pearson correlation, independent sample t-test, and one-way ANOVA were used for univariate analysis. Linear regression was used to determine the predictive power of independent variables on CV risk.

### Findings

#### Demographic Characteristics of the Participants and SDH

One hundred and forty-five patients with schizophrenia were included in this study. Their mean age was 44.9 years (SD = 8.4). Two-thirds of them were male (64.8%). Nearly half of them perceived enough monthly income (52.4%).

Education domain: About 40% of participants had primary school level, followed by high school (33.1%) and secondary school (19.3%).

Economic stability domain: Over half of the participants were unemployed (54.5%). The average monthly income for the whole family was about 118.5 USD (SD = 43.7), which was considered low economic status.

Built and neighborhood environment domain: More than half of the participants were rural inhabitants (55.2%).

Social and community context domain: Almost all participants (97.2%) were living with caregivers in the same household. However, the majority of them were single (73.8%).

Regarding health and health care domain: The average year for the duration of illness was 8.9 years (SD = 5.4). Almost all (94.5%) had been prescribed atypical antipsychotic drugs (see Table 1).

**Table 1** Social Determinants of Health of the Participants (N = 145)

| Social Determinants of Health                    | Frequency (n) | Percent (%) | $\bar{X}$ | SD   |
|--|---------------|-------------|-----------|------|
| <b>Education domain</b>                          |               |             |           |      |
| <b>Education</b>                                 |               |             |           |      |
| Primary school                                   | 59            | 40.7        |           |      |
| Secondary school                                 | 28            | 19.3        |           |      |
| High school                                      | 48            | 33.1        |           |      |
| Undergraduate                                    | 10            | 6.9         |           |      |
| <b>Economic stability domain</b>                 |               |             |           |      |
| <b>Employment</b>                                |               |             |           |      |
| Unemployed                                       | 79            | 54.5        |           |      |
| Employed   | 66            | 45.5        |           |      |
| <b>Family monthly income (USD)</b>               |               |             |           |      |
| Min = 44.8, Max = 279.9                          |               |             | 118.5     | 43.7 |
| <b>Neighborhood and built environment domain</b> |               |             |           |      |
| <b>Residence</b>                                 |               |             |           |      |
| Urban  | 65            | 44.8        |           |      |
| Rural  | 80            | 55.2        |           |      |
| <b>Social and community context domain</b>       |               |             |           |      |
| <b>Family support</b>                            |               |             |           |      |
| Living with caregiver in the same household      | 141           | 97.2        |           |      |
| Living alone                                     | 4             | 2.8         |           |      |
| <b>Marital status</b>                            |               |             |           |      |
| Single   | 107           | 73.8        |           |      |
| Married  | 23            | 15.9        |           |      |
| Divorced, Widowed                                | 15            | 10.3        |           |      |
| <b>Health and health care domain</b>             |               |             |           |      |
| <b>Antipsychotic drugs</b>                       |               |             |           |      |
| Typical antipsychotic drugs                      | 1             | 0.7         |           |      |
| Atypical antipsychotic drugs                     | 137           | 94.5        |           |      |
| Both typical and atypical                        | 7             | 4.8         |           |      |
| <b>Duration of illness (years)</b>               |               |             |           |      |
| Min = 2, Max = 30                                |               |             | 8.94      | 5.4  |

### Cardiovascular Risk

Concerning CV risk factors, most participants (65.5%) reported that their parents did not develop CVD before the age of 60. Most of them were non-smokers (62.1%), had no obesity (89.7%), and no hypertension (84.8%). Only 8.3% of the participants had underlying medical diseases, including diabetes, hypertension, and CVD. In addition, 42.8% reported that they

experienced stress as a consequence of financial burden, family, or daily hassles.

Considering protective factors, 62.1% consumed healthy diet based on three groups of foods in Mandalay, Myanmar, such as body-growth food, energizing food, and disease-protective food. Nearly eighty percent (78.6%) did not do any physical activities for at least 30 minutes per day (see Table 2).

**Table 2** Risk and Protective Factors for CVD of the Participants (N = 145)

| Cardiovascular Disease       | Frequency (n) | Percent (%) | $\bar{X}$ | SD |
|------------------------------|---------------|-------------|-----------|----|
| <b>Risk Factors</b>          |               |             |           |    |
| <b>Age and gender</b>        |               |             |           |    |
| Male                         | 94            | 64.8        |           |    |
| < 40 years                   | 30            | 20.7        |           |    |
| 40-65 years                  | 64            | 44.1        |           |    |
| Female                       | 51            | 35.2        |           |    |
| < 50 years                   | 28            | 19.3        |           |    |
| 50-70 years                  | 23            | 15.9        |           |    |
| <b>Hereditary</b>            |               |             |           |    |
| Not known exactly            | 6             | 4.1         |           |    |
| Parents without CVD < 60 yrs | 95            | 65.5        |           |    |
| Parents with CVD < 60 yrs    | 44            | 30.3        |           |    |
| <b>Smoking</b>               |               |             |           |    |
| Nonsmokers                   | 90            | 62.1        |           |    |
| Former smokers               | 4             | 2.7         |           |    |
| Smokers                      | 51            | 35.2        |           |    |
| <b>Obesity</b>               |               |             |           |    |
| BMI < 30kg/m <sup>2</sup>    | 130           | 89.7        |           |    |
| BMI ≥ 30kg/m <sup>2</sup>    | 15            | 10.3        |           |    |
| <b>BP</b>                    |               |             |           |    |
| <140/90mmHg                  | 123           | 84.8        |           |    |
| ≥140/90mmHg                  | 22            | 15.2        |           |    |
| <b>Medical history</b>       |               |             |           |    |
| No                           | 133           | 91.7        |           |    |
| Yes                          | 12            | 8.3         |           |    |
| <b>Stress</b>                |               |             |           |    |
| Yes                          | 62            | 42.8        |           |    |
| No                           | 83            | 57.2        |           |    |
| <b>Protective factors</b>    |               |             |           |    |
| <b>Healthy diet</b>          |               |             |           |    |
| Yes                          | 90            | 62.1        |           |    |
| No                           | 55            | 37.9        |           |    |
| <b>Physical activity</b>     |               |             |           |    |
| No                           | 114           | 78.6        |           |    |
| Yes                          | 31            | 21.4        |           |    |

### Results by Research Questions

The findings showed that 6.3% had maximal CV risk based on CV RISK. The mean score for cardiovascular risk was 7.94 (SD = 2.20). Table 3 describes the details of CV risk.

Intercorrelation was analyzed only for continuous and ordinal measures. Regarding intercorrelations, duration of illness and residence had positive association with CV risk ( $r = .29, p = .001$ ;  $r = .38, p < .001$ , respectively). The intercorrelations between variables were shown in Table 4.

**Table 3** Prevalence of CV Risk by Age and Gender

| Category                         | Optimal<br>CV Risk |      | Maximal<br>CV Risk |     | $\bar{X}$ | SD   | Possible<br>Range |
|----------------------------------|--------------------|------|--------------------|-----|-----------|------|-------------------|
|                                  | n                  | %    | n                  | %   |           |      |                   |
|                                  | <b>Without CVD</b> |      |                    |     |           |      |                   |
| <40 years (M); <50 years (F)     | 56                 | 38.6 | 2                  | 1.4 | 7.16      | 1.32 | 5.6-11            |
| 40-65years (M); 50-75 years (F)  | 80                 | 55.2 | 4                  | 2.8 | 8.08      | 1.35 | 5.3-12            |
| <b>With CVD</b>                  |                    |      |                    |     |           |      |                   |
| 40-65 years (M); 50-75 years (F) | 0                  | 0    | 3                  | 2.1 | 18.67     | 5.77 | 12-22             |
| Total                            | 136                | 93.8 | 9                  | 6.3 | 7.94      | 2.20 | 5.3-22            |

**Table 4** Inter Correlation Among Education, Income, Family Support, Duration of Illness, Antipsychotic Drugs, Residence, and Cardiovascular Risk (N = 145)

| Variables              | 1                  | 2                  | 3                 | 4                 | 5                  | 6                  | 7 |
|------------------------|--------------------|--------------------|-------------------|-------------------|--------------------|--------------------|---|
| 1) Education           | 1                  |                    |                   |                   |                    |                    |   |
| 2) Income              | .24 <sup>1**</sup> | 1                  |                   |                   |                    |                    |   |
| 3) Family support      | .14 <sup>1</sup>   | .10 <sup>1</sup>   | 1                 |                   |                    |                    |   |
| 4) Antipsychotic drugs | -.08 <sup>1</sup>  | -.17 <sup>1*</sup> | -.15 <sup>1</sup> | 1                 |                    |                    |   |
| 5) Duration of illness | -.06 <sup>1</sup>  | .08 <sup>2</sup>   | .10 <sup>1</sup>  | -.08 <sup>1</sup> | 1                  |                    |   |
| 6) Residence           | .09 <sup>1</sup>   | .16 <sup>1</sup>   | -.10 <sup>1</sup> | -.10 <sup>1</sup> | .13 <sup>1</sup>   | 1                  |   |
| 7) Risk score          | .09 <sup>1</sup>   | .05 <sup>2</sup>   | -.05 <sup>1</sup> | -.11 <sup>1</sup> | .22 <sup>2**</sup> | .38 <sup>1**</sup> | 1 |

\*  $p < .05$ , \*\*  $p < .01$ , <sup>1</sup> Spearman correlation, <sup>2</sup> Pearson correlation

Independent samples t-test was performed to compare cardiovascular risk between unemployed and employed groups. There was no significant difference in CV risk between the unemployed and employed ( $\bar{X} = -.28$ ,  $SD = .36$ );  $t_{(143)} = -.76$ ,  $p = .44$ ).

One-way ANOVA test was performed to compare the effect of marital status on CV risk. There was no significant difference in CV risk between at least two groups [ $F_{(3, 141)} = .611$ ,  $p = .609$ ].

After testing assumptions, the variables were put into the model by enter method. According to

regression analysis (as shown in Table 5), education, income, employment, marital status, family support, antipsychotic drugs, duration of illness, and residence jointly accounted for 18% of the variance in CV risk among patients with schizophrenia ( $R^2 = .18$ ,  $F_{(8,136)} = 3.82$ ,  $p < .001$ ). Employment was coded into dummy variables (unemployed-0 and employed-1). Among eight predictors, residence ( $\beta = .31$ ,  $p < .001$ ), duration of illness ( $\beta = .22$ ,  $p = .007$ ), and employment ( $\beta = .16$ ,  $p = .050$ ) were significantly predicted CV risk among patients with schizophrenia.

**Table 5** Prediction of SDH on CV Risk (N = 145)

| Variables           | B     | SE   | $\beta$ | T    | p-value | 95%CI |       |
|---------------------|-------|------|---------|------|---------|-------|-------|
|                     |       |      |         |      |         | lower | Upper |
| (constant)          | 4.76  | 2.29 |         | 2.08 | .039    | .23   | 9.29  |
| Residence           | 1.34  | .36  | .31     | 3.73 | < .001  | .63   | 2.06  |
| Duration of illness | .09   | .03  | .22     | 2.74 | .007    | .03   | .15   |
| Employment          | .71   | .36  | .16     | 1.98 | .050    | .001  | 1.42  |
| Marital status      | .20   | .21  | .08     | .96  | .34     | -.22  | .63   |
| Education           | .61   | .36  | .14     | 1.71 | .09     | -.10  | 1.33  |
| Income              | -1.55 | .00  | -.05    | -.67 | .50     | .00   | .00   |
| Antipsychotic drugs | -.11  | .77  | -.01    | -.14 | .89     | -1.63 | 1.41  |
| Family support      | -.50  | 1.09 | -.04    | -.46 | .64     | -2.66 | 1.65  |

$R = .43$ ,  $R^2 = .18$ , adjusted  $R^2 = .14$ ,  $F = 3.82$ ,  $p < .001$

## Discussion

The findings showed that around six percent of participants were at high risk of CVD. This rate was slightly lower than previous studies<sup>4,17</sup> which reported CV risk in 10 years among patients with schizophrenia, though based on different CV risk scores of 7.6% and 7.4%, respectively. The possible

explanation of the findings may be due to various factors, including risk and SDH factors.

Concerning risk factors, as shown in Table 1, the majority of participants in this study were at middle age ( $\bar{X} = 44$  years), which was consistent with recent studies in which most of the patients with SMI were at middle age.<sup>1,3</sup> However, one study

revealed that the significantly increased CV risk associated with SMI is evident in young adults.<sup>18</sup> Thus, the data recommended more thorough screening of cardiovascular risk factors for patients with SMI starting at a younger age.

Concerning sex, two-thirds of participants were male (65%), which was consistent with the previous review in which the incidence of schizophrenia was higher among men than women, with a ratio of 1.4.2 As for sex differences in CV risk for schizophrenic patients, a higher risk was found in females than males.<sup>2</sup>

Concerning SDH factors, the majority of participants in this study had low education, low household income, and were unemployed. Low socioeconomic status or poverty pushes them to have lower access to health care services. As for the social context shown in Table 1, the vast majority were single but lived with other family members in the same household. According to Asian culture, family relationships with care, help, and respect for each other are valued. Family members have a willingness to live with cousins or next generations in the same household, and extended families are found, especially in rural areas. It was evident that receiving family support or a good family environment is essential for the willingness to change or enhance cardiovascular preventive behaviors (i.e., physical activity, healthy diet consumption, and medication adherence).<sup>19</sup> The participants in this study were likely to receive good family support. As for health and health care, the majority had been prescribed

atypical antipsychotic drugs, and nearly 80 percent had been prescribed more than one type of antipsychotic drugs: risperidone (86.9%), followed by clozapine (60.7%) and olanzapine (27.6%). There is a difference in the metabolic effects of each individual antipsychotic drug. Then, the percent of participants who had metabolic abnormalities (i.e., obesity and diabetes) in this study was low. Although it was evident that the duration of mental illness was significantly associated with CV risk, the presence of negative symptoms, medical comorbidity, substance use, or smoking can also impact CV risk.<sup>4,17</sup> However, the illness duration in this study was slightly lower than that in previous studies,<sup>4,17</sup> and only a few participants have comorbidity and smoke. Most participants in our study were from rural areas, where the undeveloped infrastructure or fragmentation between mental and medical health services, inadequate human resources or health services, and low health care expenditure can be hindrances to access to health care for participants. To conclude, these characteristics of participants showed the inequality in access to health care services, which could lead to a high risk of CVD. However, the majority of the participants lived in the same household with family members and may receive family support, as well as a lower likelihood of behavioral risk factors (i.e., smoking and unhealthy diet), which might be an explanation for the slightly lower rate of patients who are at risk of CVD.

Residence was found to be the strongest predictor of CV risk in this study ( $\beta = .31, p < .001$ ). This finding could be due to several factors. First, the economic status of Myanmar rural inhabitants was lower than that of urban inhabitants. Individuals with lower economic status were more likely to develop unhealthy behaviors (i.e., smoking, betel chewing, and sedentary behaviors).<sup>20</sup> Second, rural inhabitants relied on herbal and traditional medicine due to their easy accessibility. Concerning human resources for health, the health work force, including doctors and nurses per 1000 population, is 1.47 in all states and regions in Myanmar. There is a wide difference in the distribution of health work force between rural and urban areas. One doctor needed to cover 633 people in urban areas, whereas one doctor needed to cover 3447 people in rural areas.<sup>21</sup> As for the mental health care system, there is a shortage of manpower (such as psychiatrists, mental health nurses, psychologists, counselors, and trained social workers), undeveloped infrastructure, and inadequate mental health services, and low expenditure on mental health care, particularly in rural areas.<sup>22</sup> According to these factors, the rural inhabitants do not get screening from health professionals and are at high risk of CVD.

Duration of illness was a significant predictor of CV risk in this study ( $\beta = .22, p = .007$ ). This finding was consistent with previous studies.<sup>4,17</sup> Patients with longer duration of illness were more likely to be physically inactive and had increased exposure

to antipsychotic drugs, which can cause metabolic abnormalities leading to CVD.<sup>4,17</sup> Another possible explanation might be that patients who had longer duration of illness had poor social and occupational functioning, thus having problems obtaining or maintaining jobs.<sup>23</sup> Then, patients with schizophrenia became dependent and had no income, which can be a hindrance to health-seeking behaviors, leading to a higher risk of CVD. Then, low socioeconomic status made them stressed, leading to engagement in unhealthy behaviors (i.e., smoking, alcohol drinking, and sedentary behaviors).<sup>24</sup> According to these explanations, patients who had longer duration of illness might be at high risk of CVD.

Employment had a significant association with CV risk in this study ( $\beta = .16, p = .050$ ). This result conforms to a previous study<sup>7</sup> in which employment had a negative association with CV risk. The unemployment rate in schizophrenia was high, resulting from cognitive impairment, deficit in social functioning, early age of the onset of schizophrenia, and low level of education.<sup>24</sup> Thus, patients with schizophrenia have poor income, which can hinder healthy food availability and health-seeking behaviors. Then, people with low socioeconomic status were associated with stress, leading to engagement in unhealthy behaviors (i.e., smoking, alcohol drinking, and sedentary behaviors).<sup>24</sup>

Education and income could not have an influence on CV risk in schizophrenia patients. This result was contrary to previous findings<sup>7-8</sup> in

which the prevalence of metabolic syndrome was high among patients with primary school and low income. This difference might be due to the participants in our study were less likely to develop CV risk factors, including smoking and consumption unhealthy diet, compared to previous studies.

Marital status, family support and antipsychotic drugs could not predict CV risk in this study. These findings were in contrast to previous literature. This might be related to the homogeneity of participants.

### Conclusion and Recommendations

The results of our study provided insight and awareness about CV risk to mental health nurses and other health professionals who are taking care of patients with schizophrenia. Regular screening and management of CV risk factors is essential to decreasing the incidence of CVD. This study also suggests psychiatric nurses to encourage patients with schizophrenia to engage in healthy behaviors and pre-vocational training to facilitate working ability in their own community after deinstitutionalization.

Residence, duration of illness, and employment could predict CV risk in this study. Future studies in which lifestyle behavior change and supported employment could reduce CV risk among patients with schizophrenia should be conducted. Moreover, the number of participants should be recruited from psychiatric hospitals and community in future studies to reduce the homogeneity of participants.

### Limitations

The data collection was conducted during the COVID-19 pandemic of which the situation restricted the process of data collection; thus, phone interview and one-single item question for certain variables were used. For further research, valid instruments such as the Neighborhood Scale and Multidimensional Scale of Perceived Social Support (MSPSS) should be used to assess neighborhood and social context.

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