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Association between unrecognized myocardial infarction and self-reported health in the Russian population aged 35-69 years.

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ABBREVIATIONS

CVD	Cardiovascular disease
WHO	world health organization
MI	myocardial infarction
IQR	Interquartile range
PCS	Physical component score
MCS	Mental component score
ECG	Electrocardiogram
MC	Minnesota code
LDL	low density lipoprotein
BMI	Body mass index
SF-12	Short form-12
UMI	Unrecognized myocardial infarction
CHD	Coronary heart disease

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1.0. Background

Regarding cardiovascular disease (CVD) and mortality associated to it, Russia remains an important population to be focused on as little studies have been conducted from this selected group. Also, little is known about the possible cause asides from the conventional factors for cardiovascular disease (1, 2,13), the Russian federation has one of the highest rates of mortality from cardiovascular disease (CVD) in the world, but record change were reported between 2005 and 2013, the age-standardized CVD mortality rates in Russia decreased by 34.3% (833.2 vs. 547.1 deaths per 100 000 population) and coronary heart disease (CHD) mortality rates by 24.7% (383.6 vs. 289.0 per 100 000 population). While the standardized CHD mortality rate decreased by 35.7% in Moscow (306.1 vs. 196.9), the decrease was 1.3 times less in St. Petersburg (362.1 vs. 258.9), 2.6 times less in the Moscow region (433.8 vs. 374.3) and 1.5 times less in the Russian Federation (37, 38). These exceptional CVD mortality rates were considered the reason for the lower life expectancy-70.9 years, possible decreased mental and physical efficiencies in the Russian population (3, 42). Cardiovascular diseases continue to be the leading cause of disability and death in the world today and the prevalence is very high in the Russian population for instance comparing the prevalence of death from cardiovascular diseases in the Russian population and their European counterpart, it was shown that 55.7% of mortality due to cardiovascular diseases in Russia to 46% in the neighboring European countries as a whole (35, 36). In the Russian federation, 29.4% of deaths occur from coronary heart disease (CHD) and 17.6% from cerebrovascular disease. Women die of CVD than men: 51% and 42% respectively (37). Furthermore, poor self-reported health and unrecognized Myocardial infarction (UMI) have been associated with increased in incidence of death, also the risk of nonfatal MI and heart failure were associated with UMI (7, 43, 45,46), poor self-reported health has been shown to be a vital source of information- the mental and physical state of an individual and these vital information may never be discovered by any other known tools that are used in the health care system today (45,47, 48, 49, 50). Hence, self-reported questionnaire tool appears to be an important diagnosing tool for further diagnosis in the health care sector.

Prospective epidemiological has shown that self-reported health predicts mortality, independently of a variety of behavioral risk factors and medical status. For example, a review of 27 studies with follow-ups ranging from 2 to 28 years concluded that those reporting poor health have a mortality risk 1.5–3.0 times greater than those reporting good health (4). A more recent meta-analysis of 22 studies showed that poor self-rated health was associated with a 1.9 times increased risk of death, again independently of diagnosed illness, as well as psychological and cognitive status (4). These studies showed an association between poor self-reported health and increased mortality rate, even after controlling for risk factors and present comorbidities. One of the suggested explanations for this association was a presence of the underline disease in people who reported poor health.

On the other hand, myocardial infarction is a major cause of death globally. The major symptom that indicates this medical condition is chest pain. A substantial proportion is accompanied by minimal, atypical or no symptoms. MI without pain was first described back in 1921. Today such events, termed “unrecognized MI”, are well documented (5). With unrecognized MI, individual goes around performing their normal day to day activities as this do not come with symptoms that could signal medical urgency to the patient however, there could be reduction in ability and productivity of the individual. Both MI with or without symptoms are associated with the similar risk of death, and have similar prognosis. Decrease in mortality due to MI could be achieved if silent MI are diagnosed and followed by necessary medical attention (6, 7).

Risk factors of atherosclerosis and myocardial infarction

Atherosclerosis remains an important risk factor to developing MI. While the risk factors to atherosclerosis are hypertension, diabetes, cholesterol and old age (14, 15, 16, 17, 18). The risk factor level in unrecognized MI seems to be an intermediate between no MI and recognized MI (19, 21). But it is not clearly established whether there are risk factors that distinguish unrecognized from recognized MI (20, 22). Differentiation between recognized and unrecognized MI cannot be demonstrated by just the risk factors that present these pathological conditions.

Prevalence of unrecognized MI

The prevalence of unrecognized MI is unknown. However, studies that have used ECG as a diagnostic modality for unrecognized MI have reported an estimated prevalence value range of 1.2% – 6.4% (21, 23, 24, 25, 26), when the differences between the results from different studies on the prevalence of unrecognized MI were evaluated, partly due to the used of different ECG criteria and the component of the various populations where these studies were conducted. The actual prevalence of unrecognized MI will be most likely more than what is reported- for instance, the prevalence of UMI in geriatrics patients were set to be between 21-68% and this study used the same diagnosing tool (44). Furthermore, ECG is found to be less sensitive in the diagnosis of unrecognized MI as compared to other imaging techniques such as cardiac magnetic resonance imaging and computed tomography. And studies that used these modalities, gave an estimated prevalence value of unrecognized MI to be in the range of 17%-21.5% in older adults and persons with suspected ischemic heart disease (17, 21, 27, 43).

Prognosis of unrecognized MI

Data that gives an extensive view into the prognosis of unrecognized MI in the general population is lacking (5). However, Increased risk of adverse cardiovascular events and death associated with unrecognized MI have been reported in cohorts of persons with known or suspected ischemic heart disease (28,29) diabetes (30) and in the elderly population (25,31). These studies researched possible differences in the prognosis associated to unrecognized and recognized MI but it was found that no differences in prognosis in both form of MI. Two studies; The Rotterdam study from 1990-93 and The Copenhagen City Heart Study from 20012 (5) have reported an increased risk of all-cause mortality associated with unrecognized MI in women (HR 1.33, 95% CI 1.11-1.58) and men (HR 1.57, 95% CI 1.30-1.89) and an increased risk of death or hospitalization for coronary heart disease (HR 2.8, 95% CI 1.6-5.0) respectively and confounders associated with cardiovascular disease were adjusted for in these studies.

Importance of this study to public health

It is convincing to suggest that some of the association between poor self-reported health and mortality can be due to higher prevalence of unrecognized MI cases in those who reported poor health. From public health point of view, it is important to determine factors that affect the quality of life and individual's wellbeing (7) and the prevalence of unrecognized MI. Given that one of the cardinal points of the public health goal is to give prevention and possible cure to diseases. This study is relevant to the public health as it helps to study the prevalence of unrecognized or silent myocardial infarction among the population and would give an overview to the situation in the general population at large who go undiagnosed of unrecognized myocardial infarction and possibly reduced in normal functional ability. Also, poor self-reported health in an individual could be an indication for further clinical diagnosis such as ECG and the tests for the risk factors to developing atherosclerosis and thus, serves as diagnostic tool.

1.1 .The aims of this study are to report:

1. Prevalence of unrecognized myocardial infarction in Russian population of Arkhangelsk and Novosibirsk in both genders ages 35 to 69.

2. The prevalence of poor self-reported mental and physical health in the study population.

3. The association between unrecognized myocardial infarction and self-reported health in the study population.

1.2. Research question

My research question is to determine if there is an association between self-reported health and unrecognized myocardial infarction in the Russian population of 35-69 years.

2.0. Method and material

2.1. Study design:

The “Know Your Heart” study is a cross-sectional study conducted within the period of November 2015- December 2018 in two Russian cities- Arkhangelsk and Novosibirsk included were 5089 participants aged 35-69 of which 4542 attended the health check.

2.2. Study population:

To address the research question, I used data from “Know Your Heart” study. The study recruited 5089 participants for the baseline interview of whom 4542 participants went on to attend a health check of these 4542 participants, 2381 were from Arkhangelsk (41.5% male) and 2161 were from Novosibirsk (42.0% male) (3).

The median age of participants from Arkhangelsk was 54 years (IQR 45–62) and from Novosibirsk 56 years (IQR 47–64) with a higher percentage of participants in the older age categories in Novosibirsk than Arkhangelsk (3). From each city, four districts were selected for the recruitment of participants. In Arkhangelsk: Lomonosovsky, Maymaksansky, MayskayaGorka and Oktyabrsky. In Novosibirsk: Dzerzinsky, Kirovsky, Leninsky and Oktyabrsky.

The regional health insurance funds provided the mode of contact to these participants such as age, sex and individual address. Names of the participants were not provided by the regional health insurance funds due to data protection regulation's law. From the information provided, a random address selection were made for visitations selected based on age, sex and district. With the aim to recruit equal number of participants from each sex and 5-years age group from each city. Participants were recruited to the study by home visits carried out by trained and experienced interviewers from a local commercial survey company (3).

2.3. Study measurement:

The baseline interview at the participant's home included questions about the self-reported health from the Short-Form 12 health survey (SF-12) (40). These interviews were conducted by using a personal assisted interviewing device, which is embedded with modern monitoring software device-GPS to monitor the location and time the various interviews were conducted automatically. Information on their age, sex, social-economic condition, education, smoking and drinking habits were collected. Two additional visits were made if and only the first visit by the research team to a participant was unsuccessful due to the absence of the participant. At the end of the home interview, the participants were scheduled for health-check at the clinic. Included in this health check are questionnaire and digital ECG (Cardiax devices (IMED ltd, Hungary) and 99.8% of the health check participants attended the test), blood collection, weight, height, waist and hip circumference measurement. The questionnaire was administered by either a nurse or a cardiologist. Participants were asked to bring all their medications with them (3).

2.4. Study variable:

Outcome:

The short form 12 (SF-12) questionnaires were used to assess self-reported health in Know Your Heart study. It uses only 12 questions from the SF-36 to reproduce the mental component and physical component scores respectively (MCS and PCS). The SF-12 summary scores (PCS-12 and MCS-12) ranges from 0 to 100, higher scores denoting better physical and mental health function (8, 11, 12). It is a shortened version of the SF-36, which itself evolved from the Medical Outcomes Study (9). It was created to reduce the burden on respondents (10). Patients fill out a 12 question survey which was then scored by the clinician or researcher.

Exposure:

The evidence of MI on ECG: The ECG was the only diagnostic technique used in this study to diagnose unrecognized MI. The ECGs were coded according to the Minnesota codes; MC 1.1–1.3 defined the evidence of prior MI. Notably, the ECG were performed and interpreted by cardiologist, Minnesota codes were assigned centrally at the University of Glasgow.

Self-reported MI is determined from answers on the question in the baseline questionnaire. Have you ever been told by a doctor- been diagnosed that you have: Myocardial infarction/ Heart attack?

Participants were assigned to four mutually exclusively categories based on the ECG results and responses to questions about previous MI;

1) Unrecognized (silent) MI: The definition of unrecognized MI will be based on two variables that were available for health check participants in the Know Your Heart study. Those are evidence of MI on ECG and self-report of MI in the questionnaire. Participant will be considered as having unrecognized MI if he/she has the evidence of MI on ECG but did not report having MI previously (3, 13).

2) Sign of MI on ECG and self-reported MI in the questionnaire

3) Self-reported MI only and no sign of MI on ECG

4) No sign and no self-report of MI

Confounders:

I adjusted for possible confounders such as sex, age, systolic and diastolic blood pressure, body mass index (BMI), smoking, diabetes, low density lipoprotein (LDL-cholesterol), High density lipoprotein (HDL-cholesterol). These set of confounders were selected based on prior evidence from research that they can affect both the exposure (MI) and the outcome (self-reported physical and mental health) (41). Confounding was considered present if the regression coefficient from the simple linear regression model changes by more than 10% in the multiple regression (32).

Furthermore, in this study the BMI is define as the body weight in kilogram divided by the height in meter square, smokers were defined as never smoker, ex-smoker and current smoker. Diabetes was defined as self-reported and/or HbA1c>6.5% and the participants were categorized as having diabetes or not. Hypertension, was defined as systolic blood pressure (SBP) > 140, diastolic blood pressure (DBP) >90 and/or medication used by the participants before and during the commencement of this study.

2.5. Exclusion criteria:

In the Know your heart study, participants who attended the baseline interview but not the health check were excluded. Participants who were not from the two selected cities and 8 districts were excluded from the study. Another criterion for exclusion was age-eligible candidate who were below the age of 35 years of age as at the time the study commenced were also excluded from this study.

Notably, some participants could not attend the health check and the reasons for this were shown that younger, male, with lower educational level, not in regular paid employment, have a worse financial situation, problem drinkers, smokers and report symptoms of major depression were less likely to attend. Those who self-reported a history of hypertension, high cholesterol, myocardial infarction, heart failure or angina were more likely to have a health check but those with self-reported previous stroke were less likely to do so. Participants living farther away from the clinic were also less likely to attend the health check (3).

2.6. Statistical analysis:

I performed descriptive statistical analysis of participants' characteristics including sex, age, physical and mental self-reported health, CVD risk factors. Percentages were calculated for the categorical variables; means and standard deviations were reported for continuous variables.

For the bivariate analysis the means and proportions of CVD risk factors were compared across categories of MI: (1) unrecognized MI; (2) sign of MI on ECG and self-reported MI in the questionnaire; (3) self-reported MI only and no sign of MI on ECG; (4) no sign or self-report of MI. Cross-tabulation and xi-square test was used as statistical test for differences in proportions (categorical variables); ANOVA was used as statistical test for differences in means (continuous variables).

First, I used univariate linear regression to assess association between unrecognized MI and self-reported health (physical and mental). Then, multivariate linear regression was used to adjust for the possible confounders such as age, sex, diabetes, obesity, blood pressure, total- and LDL- cholesterol, BMI, smoking. The data were analyzed by IBM SPSS Statistics version 25.0.

2.7. Ethical approval and consent:

The Know Your Heart study got approval from the London School of Hygiene & Tropical Medicine (approval number 8808 received 24.02.2015; for sub-study involving patients in treatment for alcohol problems approval number 12018; received 11/01/2017), Novosibirsk State Medical University (approval number 75 approval received 21/05/2015), the Institute of Preventative Medicine (no approval number ; approval received 26/12/2014), Novosibirsk and the Northern State Medical University, Arkhangelsk(approval number 01/01-15 received 27/01/2015; Signed informed consent was obtained both at baseline interview and at the health check. Agreements for interview were obtained verbally. Data were obtained for analysis done in this thesis (3).

3.0 Results

Responses and health check data were obtained from 4,504 participants (Table 1). In this study, the respondents are well represented with respect to the selected age group and sex, the percentage of female in this study is higher than that of the male participants 58% and 42% respectively and on the average, the highest number of participants fall in the +65 age group and this number is lower with decreased in age. The prevalence of diabetics was low (3.8%) and 49.4% of the participants stated they have never smoked, while 25.2% were ex-smokers however, the sum of these values surpass the number of current smokers (25.2%). The mean distribution of the values of body mass index 28.2 kg/m2 (5.6), waist to hip ratio 0.1 (0.9), total cholesterol 5.5 mmol/L (1.2), low density lipoprotein cholesterol 3.7 mmol/L (0.9), systolic blood pressure 132.7 mmHg (20.2) and diastolic blood pressure 83.1 mmHg (11.4). Unlike other risk factors of poor self-reported health, the prevalence of hypertension in this population are relatively high (50.2%) in about half of the population and the prevalence of diabetic is low 4% of the studied population. The result shows that 2.3% of the population has unrecognized MI and this value is close in comparison with the prevalence of other forms of classified MI in this study namely; signs of MI on ECG and self-reported 1.2%, MI self-reported only 4.8% and the representation of no MI in the studied population is 90.9%. As regards the SF-12 summary mental and physical health scores, the result shows the mean for mental health is 49.3 and physical health is 44.3 while the score ranges from 0 to 100. There is a notable dispersion from the means of both variables.

The means and prevalence for cardiovascular risk factors were compared between participants with and without MI (Table 2). The sex distribution in these groups is uneven, the percentage of myocardial infarction is higher in the male participants and this can be seen across all the categories of myocardial infarction in this study. The prevalence of both unrecognized and recognized MI is low among young people and these values appear to increase with age; there are significant differences between the BMI and waist to hip ratio of the participants with unrecognized MI and those without MI however, there is a notable difference in the average value of BMI among the participants who self-reported MI only likewise is the waist to hip ratio, difference is noted with those who have signs of MI on ECG and self-reported. The percentages of diabetic and hypertension are lower in the participants with unrecognized MI as to that with recognized MI. There are significant differences in the high density lipoprotein, systolic blood pressure, diastolic blood pressure, diabetes and hypertension among those with myocardial infarction and the people without myocardial infarction. The prevalence of current smoker and ex-smoker are highest among the people with signs of MI on ECG and self-reported. The study shows that the percentage of myocardial infarction among never smokers is high along the same categories of myocardial infarction except for those who show signs of MI on ECG and self-reported of MI. Furthermore, self-reported health gives information on how an individual perceives and evaluate their health. The mean value of self-reported mental health is highest among those reporting sings of MI on ECG and self-reported, followed by those with unrecognized MI- this mean is approximately the same to those without MI. The mean is seen to be at the lowest among those that self-report MI only. On the other hand, the mean values of self-reported physical health appeared worse compared to the self-reported mental health. The mean value is highest within those without MI, followed by those with unrecognized MI and the mean appeared lowest among those reporting sings of MI on ECG and self-report, and self-report only respectively. Hence, the prevalence of self-reported health among this population is low given that the highest mean value for self-reported mental health is 52.2 among those that reported sings of MI on ECG and self-report and that self-reported physical health is 45.0 among those without MI and these are statistically significant.

Table1. Descriptive characteristics of KYH study participants, N = 4504.

Variable name	Mean (SD) or Percentage (N)	Missing N*
Sex		
Male, %	41.9 (1,888)	
Female, %	58.1(2,616)	
Age (at health check) 5yr grp		
Put age groups here		
35-39	8.6 (389)	
40-44	12.6 (569)	
45-49	13.3 (606)	
50-54	14.6 (657)	
55-59	15.5 (696)	
60-64	16.9 (761)	
65+	18.5 (831)	
BMI (kg/m2)	28.2 (5.6)	15
Waist to hip ratio	0.9 (0.1)	3
Total cholesterol (mean, mmol/L)	5.5 (1.2)	70
HDL-cholesterol (mean, mmol/L)	1.4 (0.4)	70
LDL- cholesterol (mean, mmol/L)	3.7 (0.9)	70
Triglycerides, (mean, mmol/L)		
SBP (mean, mmHg)	132.7 (20.2)	356
DBP (mean, mmHg)	83.1 (11.4)	356
Diabetes (self-report and/or HbA1c>6.5%)		195
No, %	91.9 (4138)	

Yes, %	3.8 (171)	
Hypertensive (measured SBP > 140, DBP >90 and/or medication use)		356
No, %	41.9 (1889)	
Yes, %	50.2 (2259)	
Smoking		13
Never smoker, %	49.4 (2223)	
Ex-smoker, %	25.2 (1133)	
Current smoker, %	25.2 (1135)	
Myocardial infarction		42
unrecognized MI, %	2.3 (102)	
sings of MI on ECG and self-reported MI, %	1.2 (52)	
self-reported MI only, %	4.8 (214)	
no MI, %	90.9 (4094)	
Self-reported health (SF-12 mental health score), mean	49.3 (10.4)	
Self-reported health (SF-12 physical health score), mean	44.3 (9.4)	

Table 2. The differences in CVD risk factors between participants with and without MI.

	unrecognized MI	sings of MI on ECG and self-report	self-report only	no MI	p-value*
Sex					0.00
Male, % (N)	59.9 (58)	78.8 (41)	53.7 (115)	40.4 (1656)	
Female,% (N)	43.1 (44)	21.2 (11)	46.3 (99)	59.6 (2438)	
Age (at health check)					0.00
35-39	5.9 (6)	0.0 (0)	0.0 (0)	16,8(689)	
40-44	16.7 (17)	5.8 (3)	3.3 (7)	16,5(676)	
45-49	6.9 (7)	1.9 (1)	2.8 (6)	15,2(623)	
50-54	8.8 (9)	5.8 (3)	13.1 (28)	14.9 (610)	
55-59	22.5 (23)	23.1 (12)	14.5 (31)	14,1(578)	
60-64	16.7 (17)	21.2 (11)	24.3 (52)	13,1(538)	
65+	22.5 (23)	42.3 (22)	42.1 (90)	9,3(380)	
BMI mean(kg/m2)	28.4 (5.6)	28.5 (5.1)	30.9 (6.6)	28.1 (5.5)	0.00
Waist to hip ratio	0.93 (0.1)	0.95 (0.1)	0.93 (0.1)	0.93 (0.1)	0.00

Total cholesterol (mean, mmol/L)	5.5 (1.3)	5.4 (1.4)	5.4 (1.3)	5.5 (1.1)	0.17
HDL-cholesterol (mean, mmol/L)	1.4 (0.4)	1.3 (0.3)	1.3 (0.3)	1.5 (0.4)	0.00
LDL-cholesterol (mean, mmol/L)	3.7 (1.0)	3.7 (1.1)	3.6 (1.0)	3.7 (0.9)	0.32
SBP (mean, mmHg)	138.3 (20.9)	142.9 (23)	138.3 (20.0)	132.1 (20.0)	0.00
DBP (mean, mmHg)	85.3 (13.3)	87.1 (13.5)	84.1 (11.3)	82.9 (11.3)	0.00
Diabetes					0.00
No, %	94.8 (92)	90.2 (48)	90.8 (187)	96.4 (3774)	
Yes, %	5.2 (5)	9.8 (9)	9.20 (19)	3.6 (141)	
Hypertensive					0.00
No, %	35.1 (33)	18.4 (9)	17.4 (34)	47.7 (1801)	
Yes, %	64.9 (61)	81.6 (40)	82.6 (161)	52.3 (1973)	
Smoking					
Never smoker, %	43.1 (44)	13.5 (7)	46.4 (98)	50.4 (2059)	
Ex-smoker, %	19.6 (20)	38.5 (20)	26.5 (56)	25.2 (1029)	
Current smoker, %	37.2 (38)	48.1 (25)	27.0 (57)	24.4 (1000)	
Self-reported	50.0 (10.9)	52.2 (10.0)	46.6 (11.7)	49.6 (10.3)	0.00

health (SF-12 mental health score), mean					
Self-reported health (SF-12 physical health score), mean	43.6 (10.2)	37.9 (9.9)	36.3 (9.4)	45.0 (9.2)	0.00

*P-value for categorical variables: analyses- crosstabs- statistics- chi-square. For continuous variables – ANOVA?

**Diabetes (DM) = self-reported diabetes and/or HbA1c>6.5%. Hypertension: SBP > 140, DBP >90 and/or medication use for hypertension.

Table3. Linear regression analysis for association between MI and Self-reported health (SF-12 mental health score)

	β coefficient (unadjusted) (95% CI)	p-value	β coefficient (adjusted for confounders*) (95% CI)	p-value
Myocardial infarction				
unrecognized MI	0.590 (-1.446, 2.627)	0.57	0.186 (-1.905, 2.277)	0.86
sings of MI on ECG and self-report	2.239 (-0.597, 5.074)	0.12	1.420 (-1.479, 4.319)	0.34
self-report only	-2.949 (-4,373, -1.525)	0.00	-3.776 (-5.285, -2.267)	0.00
no MI	0 (REF)		0 (REF)	

*confounders; sex, age, systolic and diastolic blood pressure, BMI, smoking, diabetes, LDL-cholesterol, HDL-cholesterol

Table4. Linear regression analysis for association between MI and Self-reported health (SF-12 physical health score)

	β coefficient (unadjusted) (95% CI)	p-value	β coefficient (adjusted for confounders*) (95% CI)	p-value
Myocardial infarction				
unrecognized MI, %	-1.080 (-2.889, 0.729)	0.24	-0.642 (-2.378, 1.094)	0.47
sings of MI on ECG and self-report, %	-6.801 (-9.319, -4.282)	0.00	-5.865 (-8.272, -3.458)	0.00
self-report only, %	-8.891 (-10.156, -7.626)	0.00	-6.162 (-7.415, -4.910)	0.00
no MI, %	0 (REF)		0 (REF)	

*confounders; sex, age, systolic and diastolic blood pressure, BMI, smoking, diabetes, LDL-cholesterol, HDL-cholesterol

In tables 3 and 4 above, linear regression was performed to check the association between the independent variables (the different classifications of myocardial infarction) and the dependent variables (mental health and physical health scores). Regarding the self-reported mental health (Table 3), the unrecognized MI and sign of MI on ECG in association with the dependent variable are not statistically significant (95% Cl, p-values 0,570 and 0,122 respectively) this implies that the mean value of SF-12 mental health score in the population with MI is 0.590 increased compared to those without MI and the mean of mental health score in the population with sign of MI on ECG and self-reported is 2,239 increase in relation to the those without MI however, both are not statistically significant- no association between the variables. Negative association exists between self-reported MI and the dependent variable (p-value < 0.001). The mean mental health score in the population with self-reported MI is 2.949 (95%Cl: -4.373, -1.525) points lower in comparison to those without MI. This pattern remains after the confounders were adjusted for in the linear regression, the mean of mental health with self-reported MI is 3,776 (95%Cl: -5.285, -2.267) points lower compared to those without MI, and this is statistically significant.

In table 4, the association between the myocardial infarction and the dependent variable (self-reported physical health score) is negative for all the categories of MI and after the adjustment for confounders. The mean differences of self-reported physical health in the groups with sings of MI on ECG and self-report, and self-report only decrease by 6,801 (95% CI: -9.319, -4.282) and 8,891 (95% CI: -10.156, 7.626) respectively in comparison with those without MI. However, differences in mean physical health score are not statistically significant for unrecognized MI category compared to no MI group.

4.0 Discussion

The prevalence of unrecognized MI is quite uncertain globally and different studies have given some ranges based on the modality of study used. In this study, the representation of unrecognized MI among the study population is 2.3% and this is in agreement with the ranges given by studies that have used the same modality of study to determine the prevalence of unrecognized MI in the given population (21, 23, 24, 25, 26). This study show that the prevalence of both recognized and unrecognized myocardial infarction are high in men compared to women and the prevalence is high in older age groups. Furthermore, body mass index, waist to hip ratio, high density lipoprotein cholesterol, low density cholesterol, systolic and diastolic blood pressure, diabetes, hypertension, smoking, self-reported physical and mental health are factors that are significantly associated with the history of myocardial infarction in this study. These results are in agreement to other studies that have reviewed the association of myocardial infarction and the classic risk factors for CVD (1, 2, 5). However, a study showed that the high risk of myocardial infarction in the Russian population cannot be explained by these classic risks only (2).

In addition, the study of the association between unrecognized MI and self-reported mental health 95% CI (-1.446, 2.627) was found to be statistically not significant. After the adjustment for confounders 95%CI (-1.905, 2.277), this association further remains statistically not significant. On the other hand, the study of the association between unrecognized MI and self-reported physical health 95% CI (-2.889, 0.729) and 95% CI (-2.378, 1.094) before and after adjustment for confounders respectively are not statistically significant. Furthermore, the participants who reported MI and had sings of MI on ECG did not have statistically significantly lower self-reported mental health score compared to group with no MI. On the other hand, this association with the self-reported physical health is negative and statistically significant even after the adjustment for confounders 95% CI (-8.272, -3.458). Finally, association between self-reported MI only (without signs of MI on ECG) and self-reported mental health is negative even after adjusted for confounders 95% CI (-5.285, -2.267) compared to participants with no MI. Also this group had statistically significant lower self-reported physical health score even after the adjustment for confounders 95% CI (-7.415, -4.910).

Regarding the risk factors that predisposed people to the development of either MI or unrecognized MI, there is no clear different factors given to the risk factor that expose an individual to developing MI or unrecognized MI (5). This study shows to be in agreement with known risk factors to developing MI or unrecognized MI as reported in other studies.

The prevalence of unrecognized MI in the study population is higher in men than in women, age an important factor in this population- for better understanding and clarification, the age was further grouped into five categories and on the average, the risk of developing unrecognized MI increased with age. This means appeared to be the same for the age groups 40-44 and 60-64 and this give room for further studies of these age groups.

Furthermore, the average value of self-reported mental health score is 49.3 (10.4) and that of self-reported physical health score is 44.3 (9.4), this implies the high poor report of mental health to reported physical health and this result is statistically significant in the studied population. The mean of self-reported mental and physical health is at the lowest among the group who self-reported there MI. However, the mean score is generally high with the self-reported mental health across the categories of myocardial infarction with association to the self-reported physical health. In conclusion, it is seen that the prevalence of self-reported mental health is higher than that of self-reported physical health and as a whole, the prevalence of the mental health is within range when compared with other studies that determined effect of MI on mental health- range of 9.17% to 65.88% (39). And the prevalence of the physical health in this population is 9.4%.

Furthermore, the age distribution and education level of this population in relation to the general country would be interesting information to briefly consider; it is learnt that the age group difference versus the percentage of the population varies slightly within both cities and both were seen to be lower compared to the generation population (3). It was also found that these two cities have the highest rate of death due to cardiovascular mortality in the whole of the Russian federation (3). Aside from the Novosibirsk, the general overview of the educational attainment in comparison to the general Russian population is not poorer. This representation shows the educational level of these cities is proportional to that of the general population of the Russian federation.

2.8. Strength and limitation:

This study has collected very detailed data on cardiovascular profile and risk factors for cardiovascular disease from the general population of two geographically distinct cities within Russia (3). The use of the same tools and standard measurement for all participants it is an important strength of this study. The potential limitation is attributed to the low response of participants from the city of Novosibirsk and population size of the study. These could create uncertainty in the generalizability of the study. The absence of participants during the health check is another limitation that is attributed to this study as well as limited power to detect associations due to the small sample size, there was no ascertainment of MI cases through the registries or hospital charts. MI was self-reported and ECG might not always be sensitive instrument to detecting unrecognized MI.

5.0 Conclusion

It can be deduced from this study that the prevalence of unrecognized myocardial infarction in this population is comparably in normal rang as reported from other studies and the prevalence of self-reported mental and physical health in the study population are conformed to normal values as reported from the results from other studies.

There was no association between unrecognized MI and self-reported health and the association between recognized myocardial infarction shows stronger effect with the physical health than the mental health as reported in the study population. There was no statistically significant association between self-reported health and unrecognized myocardial infarction.

6.0 Future perspectives

Studies to further look at the major factors for poor self-reported health in this population would be an area of interest, besides age, education and sex little is known about other factors that are capable of influencing the prevalence of self-reported health among this population.

In addition, self-report of pain is a hallmark for myocardial infarction. It will be of interest to further study how the different genders response to pain that is secondary to the occurrence of myocardial infarction.

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