Research Article

The Correlation between Gender Inequalities and Their Health Related Factors in World Countries: A Global Cross-Sectional Study

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The study aimed to investigate gender inequalities and their health associated factors in world countries. A cross-sectional survey was undertaken using data of United Nations Development Programme (UNDP) and World Health Organization (WHO). The main variable in this study was gender inequality index (GII). All countries were stratified by WHO regions. Pearson correlation coefficient was used to assess the linear correlation between GII and investigated factors by WHO regions. The mean of GII was greater in Africa and lower in Europe region. There was negative significant association between GII and life expectancy at birth and mean years of schooling, prevalence of current tobacco smoking, high blood pressure and overweight and obesity, alcohol consumption rate, and cancer death rate. But there was positive significant association between GII and noncommunicable diseases death rates. In conclusion, gender inequalities, though decreasing over the past decades in world, remain notably greater in Africa and Eastern Mediterranean regions than in Europe. Gender inequality is also an important issue which is related to health factors. Hence, countries will need to focus on public health intervention and equal distribution of economic resources to reduce gender inequality in society.

1. Introduction

Gender is a range of characteristics, roles, and behaviour patterns. The term gender distinguishes women from men socially and culturally and relations of power between them [1]. Gender affects most of the known factors related to health, including education, income, occupation, social networks, physical and social environments, and health services. Accordingly, gender has a significant influence on health and well-being throughout life [2–4].

Achieving gender equality is one of the leading millennium development health goals [5]. In developed countries, for example, Canada, efforts to promote gender equality

in education and employment have been numerous [6], but many developing countries exhibit considerable gender inequality in education [7], employment [8], and health outcomes [9]. For example, there are large discrepancies in employment status between the sexes in black South African adults [8]. In addition, rural Chinese women have a significantly lower educational level than men [10]. While gender differences in health, assessed in terms of mortality and morbidity, have been reported in most developed countries over recent decades [11], less attention has been paid to the pattern of health care services use.

According to previous evidence, gender differences are reported in health and health care utilization, as women

experience poorer health than men [12–14]. But some studies have investigated that, after controlling for health outcomes, women have higher utilization rates of medical services than men [15–17]. Numerous studies in the literature have reported that determinants of gender differences include welfare indicators (e.g., education and income) and behavioural (e.g., smoking and drinking) and social factors (e.g., social support and socioeconomic status) [18–20].

Although previous studies reported that global gender inequality is declining [21, 22], gender inequity in health still exists even in developed countries [23, 24]. Therefore, our purpose in this study was to investigate gender inequalities and their associated factors in world countries.

2. Materials and Methods

In this cross-sectional study, which was performed in 2013, we used dataset regarding International Human Development Indicators including gender inequality index (GII), life expectancy at birth, mean years of schooling and income in all countries worldwide reported by United Nations Development Programme (UNDP) [25]. The main variable in our study was gender inequality index. From the data, 54 countries were excluded because of missing observations in some variables especially gender inequality index. Hence, 139 countries remained for analysis. According to the UNDP report [26], gender inequality index is a new index for measurement of gender disparity. The value of GII ranges between 0 and 1, with 0 being 0% inequality, indicating that women fare equally in comparison to men, and 1 being 100% inequality, indicating that women fare poorly in comparison to men. There are five steps for computing the GII [27]. The GII can be calculated as follows:

$$GII = 1 - \frac{\text{Harm}(G_F, G_M)}{G_{\overline{F}, \overline{M}}}, \quad (1)$$

where $\text{Harm}(G_F, G_M)$ represents the harmonic mean to create the equally distributed gender index and $G_{\overline{F}, \overline{M}}$ represents the geometric mean of the arithmetic means for related indicator.

The continuous independent variables including non-communicable disease (NCD) death rates, prevalence of current tobacco smoking, high blood pressure and body mass index greater than 25, alcohol consumption rate, and cancer death rate used in the present study were estimated by World Health Organization (WHO) using standard methods to maximize cross-country comparability [28].

The explanation of indicators that were used by WHO is as follows: age-standardized death rate for NCDs per 100000 individuals and age-standardized death rate for cancers, prevalence of current daily tobacco smoking among adults (%), adult per capita consumption in liters of pure alcohol, prevalence of raised blood pressure among adults (defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or on medication for raised blood pressure (%)), and prevalence of overweight and obesity in adults and adolescents (defined as body mass index greater

TABLE 1: The list of ten countries with the highest and the lowest gender inequality index by WHO regions.

Country	Region	Gender inequality
Iraq	Eastern Mediterranean	0.803
Yemen	Eastern Mediterranean	0.791
Niger	Africa	0.737
Mali	Africa	0.722
Democratic Republic of the Congo	Africa	0.722
Mauritania	Africa	0.718
Afghanistan	Eastern Mediterranean	0.709
Saudi Arabia	Eastern Mediterranean	0.682
Papua New Guinea	Western Pacific	0.682
Central African Republic	Africa	0.679
Sweden	Europe	0.065
Denmark	Europe	0.068
Netherlands	Europe	0.077
Norway	Europe	0.083
Switzerland	Europe	0.084
Finland	Europe	0.102
Germany	Europe	0.105
Republic of Korea	Western Pacific	0.118
Spain	Europe	0.118
Iceland	Europe	0.121

than 25 kg/m² for overweight or 30 kg/m² for obesity or for adolescents).

All countries were stratified by WHO regions. The first analysis undertaken was to determine mean of GII, life expectancy at birth, and education (years) among WHO regions. Pearson correlation coefficient was used to assess the linear correlation between GII and life expectancy at birth and mean years of schooling and income. In addition, correlation between GII and other continuous variables was also assessed. Comparisons among WHO regions (Africa, Americas, Eastern Mediterranean, Europe, South East Asia, and Western Pacific) were done with One way ANOVA (Bonferroni test as post hoc). Comparisons, among gender groups for the mean of continuous variables, were done with the *t*-test.

All analyses were conducted at 95% significant level using statistical software STATA 11 (StataCorp, College Station, Texas).

3. Results

The list of ten countries with the highest and the lowest gender inequality index by WHO regions was illustrated in Table 1. Half of the countries with the highest index of GI were African and the majority of countries with the lowest gender inequality index were European.

Table 2 summarizes the mean of gender inequality index, life expectancy at birth, and education (years) by WHO

TABLE 2: The mean of gender inequality index, life expectancy at birth, and education (years) by WHO regions.

WHO regions	Gender inequality Mean [95% CI]	Education Mean [95% CI]	Life expectancy at birth Mean [95% CI]
Africa	0.61 [0.58, 0.64]	5.01 [4.27, 5.75]	55.63 [53.39, 57.88]
America	0.45 [0.41, 0.48]	8.29 [7.62, 8.96]	74.31 [72.80, 75.81]
Eastern Mediterranean	0.56 [0.48, 0.63]	6.14 [5.09, 7.19]	70.45 [66.88, 74.02]
Europe	0.23 [0.19, 0.27]	10.60 [10.25, 10.96]	76.79 [75.35, 78.22]
South East Asia	0.52 [0.43, 0.61]	5.54 [4.34, 6.75]	71.19 [68.11, 74.26]
Western Pacific	0.33 [0.23, 0.42]	8.69 [7.20, 10.18]	73.60 [69.84, 77.36]
Total	0.42 [0.39, 0.46]	7.89 [7.41, 8.37]	70.08 [68.43, 71.74]

regions. Overall, the mean of GII, mean year of schooling of adults, and life expectancy at birth in all countries worldwide were 0.42 [95% CI: 0.39, 0.46], 7.89 (± 2.98 years), and 70.08 (± 9.64 years), respectively. As shown in Table 2, the highest mean of life expectancy at birth and education is related to Europe region and the lowest mean of them is related to Africa region. The mean of GII in Europe region was significantly lower than in South East Asia and Western Pacific regions ($P = 0.003$ for both comparisons). The distribution of GII in world countries is shown in Figure 1.

According to the results of Table 4, in all WHO regions, GII was strongly and significantly associated with life expectancy at birth and mean years of schooling. Furthermore, there was also negative significant association between GII and income in all WHO regions except in Eastern Mediterranean region.

The Pearson's correlation among these variables (gender inequality index and NCD death rates, prevalence of current tobacco smoking, high blood pressure and body mass index greater than 25, alcohol consumption rate, and cancer death rate) was presented in Table 4. There were negative significant associations between GII and these variables ($P < 0.001$ for all relation). The GII was highly correlated to NCD death rates ($r = 0.54$, $P < 0.001$).

The NCD death rates, prevalence of current tobacco smoking, high blood pressure and body mass index greater than 25, alcohol consumption rate, and cancer death rate by WHO regions and gender were summarized in Table 3. As shown in Table 3, in total, there were significant differences in raised blood pressure (42.47) and current tobacco smoking prevalence between men and women ($P < 0.001$ for both comparisons).

4. Discussion

The present study demonstrates the first comprehensive global-based estimates of gender inequality index and its health related factors in world countries including descriptive findings which resulted from UNDP and WHO reports [25, 28]. One of the major findings from this study is that the mean of GII is greater among Africa than among other WHO regions in worldwide. Generally, gender inequalities in worldwide may be explained by the differences between women and men in employment status, healthy life years,

FIGURE 1: Distribution of gender inequality index worldwide, 2011.

income, lifestyles, and use of health care services [10, 14, 17, 29].

Our results showed that there was a negative significant relation between the GII and life expectancy at birth, in accordance with results of previous studies. Women live longer in nearly all countries worldwide. On the other hand, life expectancy in women is higher than in men [30, 31]. According to van Oyen et al. study, the gender gap in life expectancy was restricted during the last decades of the twentieth century in most but not all European countries [32]. In addition, McCartney et al. reported that gender differences in mortality are dependent on modifiable lifestyle factors. For example, smoking has been considered one of the main causes of the gender difference in mortality across Europe [19].

Our study demonstrates disparities in the mean of schooling among world countries. Furthermore, there was a negative significant relationship between GII and education. The existence of education differentials among women and men has been well established [10, 29]. Also women have a lower social position as a result of a lower education and this may affect the gender difference in health among world countries. This result is consistent with results of previous investigations [33].

Little has been done to estimate gender inequalities in their related factors such as NCD mortality, education, and welfare indicators, particularly in low or middle income countries. Our results clearly show that, overall, there is correlation between GII and NCD mortality rate, prevalence

TABLE 3: The NCD death rates, prevalence of current tobacco smoking, high blood pressure and body mass index greater than 25, alcohol consumption rate, and cancer death rate by WHO regions and gender.

WHO regions	NCD mortality			Smoking			Raised blood pressure			BMI > 25			Cancers	Alcohol				
	Male	Female	P value	Total	Male	Female	Total	Male	Female	P value	Total	Male			Female	P value		
Africa	41.73	42.40	0.993	817.90	1716	3.07	0.001	10.12	42.03	39.03	0.007	40.50	24.35	35.21	0.001	30.00	106.58	5.82
America	125.24	126.79	0.993	575.18	18.09	10.93	0.006	14.53	42.75	36.75	0.001	39.66	59.43	64.22	0.031	61.95	149.39	8.40
Eastern Mediterranean	71.18	56.12	0.783	667.92	2778	4.97	0.001	17.80	36.83	32.55	0.028	35.03	58.72	64.73	0.249	61.61	99.00	0.99
Europe	106.41	110.19	0.919	624.79	33.24	19.60	0.001	26.42	47.66	43.13	0.001	45.33	58.04	48.16	0.001	53.17	166.12	11.23
South East Asia	793.92	622.90	0.811	762.80	34.30	3.86	0.001	19.08	38.12	34.78	0.078	36.40	16.44	24.86	0.202	20.76	108.56	2.34
Western Pacific	238.91	206.16	0.894	729.73	38.58	13.37	0.001	25.98	39.23	32.82	0.001	34.24	52.67	54.29	0.844	53.48	122.87	4.74
Total	144.21	130.63	0.82	693.36	2782	11.08	<0.001	19.61	42.47	37.80	<0.001	39.78	47.69	49.41	0.216	48.63	131.90	6.84

Data are presented as the rate and the comparisons were done using *t*-test.

TABLE 4: Correlation between gender inequality index and related variables by WHO regions.

	Africa	America	Eastern Mediterranean	Europe	South East Asia	Western Pacific	Total
Income	-0.80 [-0.91, -0.60]	-0.80 [-0.92, -0.54]	-0.31 [-0.72, 0.27]	-0.77 [-0.87, -0.60]	-0.84 [-0.98, -0.24]	-0.79 [-0.93, -0.44]	-0.73 [-0.81, -0.63]
Life expectancy at birth	-0.66 [-0.83, -0.36]	-0.65 [-0.86, -0.26]	-0.61 [-0.86, -0.11]	-0.76 [-0.87, -0.59]	-0.94 [-0.99, -0.64]	-0.95 [-0.99, -0.86]	-0.79 [-0.85, -0.71]
Education	-0.69 [-0.85, -0.41]	-0.80 [-0.92, -0.52]	-0.48 [-0.81, 0.07]	-0.48 [-0.69, -0.19]	-0.76 [-0.96, -0.02]	-0.77 [-0.92, -0.41]	-0.83 [-0.88, -0.76]
NCD mortality	0.09 [-0.31, 0.46]	0.03 [-0.44, 0.49]	0.60 [0.10, 0.86]	0.71 [0.51, 0.84]	0.34 [-0.55, 0.87]	0.86 [0.60, 0.95]	0.53 [0.40, 0.65]
Smoking	-0.06 [-0.44, 0.34]	-0.20 [-0.61, 0.29]	-0.49 [-0.81, 0.05]	0.15 [-0.18, 0.44]	0.24 [-0.63, 0.84]	0.46 [-0.10, 0.80]	-0.44 [-0.58, -0.29]
Hypertension	0.02 [-0.41, 0.45]	-0.27 [-0.63, 0.18]	-0.31 [-0.77, 0.35]	0.04 [-0.31, 0.37]	-0.45 [-0.98, 0.90]	-0.39 [-0.76, 0.18]	-0.26 [-0.42, -0.09]
BMI > 25	-0.56 [-0.78, -0.22]	-0.34 [-0.70, 0.15]	-0.46 [-0.80, 0.09]	0.09 [-0.23, 0.39]	-0.94 [-0.99, -0.62]	-0.14 [-0.63, 0.42]	-0.34 [-0.50, -0.17]
Cancers death rate	0.00 [-0.39, 0.39]	-0.51 [-0.79, -0.06]	-0.14 [-0.62, 0.43]	0.11 [-0.21, 0.41]	-0.60 [-0.93, 0.28]	-0.12 [-0.61, 0.44]	-0.53 [-0.65, -0.39]
Alcohol	-0.17 [-0.52, 0.24]	-0.38 [-0.72, 0.11]	-0.29 [-0.71, 0.28]	-0.07 [-0.38, 0.25]	-0.12 [-0.80, 0.69]	-0.42 [-0.78, 0.15]	-0.54 [-0.66, -0.40]

Data are presented as the *r* value in Pearson's correlation test and 95% confidence interval.

of current tobacco smoking, high blood pressure and body mass index greater than 25, alcohol consumption rate, and cancer death rate. But there was no significant correlation between GII and these variables among WHO regions. It is possible that the small number of countries in subgroups by WHO regions in this study might have influenced our results.

Alcohol drinking is one of the major public health concerns worldwide and gender differences in roles and other behavior patterns are one important context for understanding alcohol problems. The results of present study showed that GII was negatively associated with alcohol consumption rate ($r = -0.53$, $P < 0.001$). In these analyses by income groups, GII was negatively associated with alcohol consumption rate among countries with high income and upper middle income ($P < 0.001$). This finding is consistent with a study that explored the association between gender differences and macrolevel across 25 European countries [32]. In that study, gender differences were positively associated with income inequality. In addition, we tested for a correlation between income and change in gender inequality index across countries and found a negative and consistent correlation ($r = -0.74$, $P < 0.001$). This finding is inconsistent with other assertions [21, 34].

Interestingly, there was a significant positive correlation between GII and NCD mortality rate while mean of NCD mortality rate did not have significant differences between men and women (97.6 versus 89.2 per 100,000, resp.). The World Health Organization reports mortality rates from NCD for men and women around the world [28]. The ratio of these rates in men and women is generally between 1 and 2. Why are NCD rates higher in men than in women? Stevens et al. indicated that the two main causes of death are cardiovascular diseases and cancers and they found both to be higher in men [35]. Besides, they reported that age-standardized NCD mortality rates are always higher for men than for women, except for diabetes. Our findings have also shown that risk factors of NCD such as raised blood pressure and smoking prevalence are higher in men than in women.

The health risks incurred by smoking are well documented, and men are more likely to smoke than women [36], although the gender gap has been closing over time and among adolescents is essentially nonexistent [37]. Among WHO regions, prevalence of current tobacco smoking is lowest for Africa region and significantly higher for Europe and Western Pacific regions. The prevalence of current tobacco smoking was found to be higher in males. Similar to our findings, previous studies also found that female gender is to be more common in light smokers [38]. Surprisingly, there was a negative significant correlation between GII and prevalence of current tobacco smoking both in whole and in subgroup by gender (Table 3).

Totally, raised blood pressure prevalence was negatively associated with increasing GII ($r = -0.26$, $P = 0.002$). This correlation was not significant by WHO regions. In many countries, hypertension is the number one risk factor for noncommunicable diseases and is a common, important, and major global public health problem [39, 40]. In many of the studies inconsistent with our study, the prevalence of hypertension was higher in men than in women [41, 42].

Unlike most of other studies, we found that men had higher raised blood pressure prevalence than women (42.47 versus 37.80, $P < 0.001$).

Some limitations and strengths of present study deserve consideration. Data for GII and its related factors were collected based on UNDP and WHO reports, allowing for comparisons of standardized data across pooled data sets. Consistent definitions in these data facilitated comparisons across several countries and WHO regions, minimizing limitations associated with sample size and selection and information bias. Although the use of pooled data from geographically and culturally diverse settings inevitably masks problems of comparability between countries, there probably is Simpson's paradox.

5. Conclusion

In conclusion, gender inequalities, though decreasing over the past decades in world, remain notably greater in Africa and Eastern Mediterranean regions than in Europe. Gender inequality is also an important issue which is related to health factors. Countries will need to focus on public health intervention and equal distribution of economic resources to reduce gender inequality in society. This cross sectional study is the first to assess the factors associated with gender inequality index using global data among World Health Organization regions. These results need to be confirmed in large epidemiological studies.

Conflict of Interests

The authors declare that there is no conflict of interests regarding the publication of this paper.

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