Burden of diabetes mellitus type 2 and its risk factors in Asia from 1990 to 2019: Updates from the 2019 Global Burden of Disease study

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Abstract

Background

The mounting burden of type 2 diabetes is a major concern in healthcare systems worldwide. The purpose of this study is to investigate the trend of type 2 diabetes from 1990 to 2019 in Asia.

Methods

All accessible data from the 2019 Global Burden of Disease study were used to estimate the diabetes mellitus type 2 prevalence, mortality and disability-adjusted life years and diabetes mellitus type 2 in Asia from 1990 to 2019. We estimated all-cause and cause-specific mortality, years of life lost (YLLs), years lived with disability (YLDs), disability-adjusted life-years (DALYs) and attributable risk.

Results

The results indicated that the human development index (HID) was positively and significantly correlated with the incidence of type 2 diabetes in men ($r = 0.481$, $P<0.05$) and women ($r=0.414$, $P<0.05$, but the correlation between death and the HDI was not significant in men and women ($P> 0.05$). The highest share of DALY risk factors in men (12093.2 per 100000) and in women (7122.4 per 100000) was related to behavioral factors. According to the results, air pollution, high fasting plasma glucose, and dietary risks are the main risk factors associated with the burden of type 2 diabetes in women and men, respectively.

Conclusion

Given that the burden of type 2 diabetes is escalating in Asia and the burden of disease can be largely controlled by managing its risk factors, the disease management program in different countries, especially in countries with high prevalence and high burden could be reduced by making policies.

Background

Diabetes is one of the top 10 leading causes of death worldwide, accounting for more than 80% of all non-communicable disease (NCDs) deaths, along with cardiovascular disease, cancer and respiratory diseases[1]. In diabetic patients, the risk of all-cause death is 2-3 times higher. Diabetes is associated with increased mortality from infection, cardiovascular disease, stroke, chronic kidney disease, chronic liver disease, and cancer[2].

Diabetes imposes a heavy global burden on public health as well as socio-economic development. Although the prevalence of this disease is beginning to decline in some countries, it has taken an upturn in recent decades in most developed and developing countries[3, 4]. To date, the International Diabetes Federation (IDF) estimated that 451 million adults worldwide suffered from diabetes in 2017, which is projected to increase to 693 million by 2045 unless effective prevention methods are adopted[5].

Despite considerable investment in clinical care and pharmaceutical research, the burden of diabetes is on rise. This surge has exceeded population growth and aging. The prevalence of diabetes in Western Europe is higher than the global and Asian average. This could be attributed to the non-modifiable risk factors, such as age and family history. Factors such as Western diet, lifestyle changes and sedentary lifestyle are also involved[6].

Developed countries such as Italy and the United States have the highest DALY of diabetes. Asian economies with advanced economy, such as South Korea and Taiwan, are joining the ranks of these countries based on GBD data[7].

Since 1980, the prevalence of type 2 diabetes in high-income countries has surpassed low- and middle-income countries[8, 9]. The number of adults living with type 2 diabetes has risen from 463 million to 700.2 million between 2019 to 2045. Total annual management costs of the disease are projected to climb from $ 760.3 billion to $ 845 billion during this period[10].

Overall, the global burden of diabetes has soared significantly in recent decades and will continue to grow in the upcoming decades. The Global Burden of Disease (GBD) survey is a summary measure that calculates years of health loss by summing YLL and YLD indices. These data allow GBD to record the burden of diabetes in the most comprehensive way and provide the information needed to prioritize and plan health services.

This study aims to examine the latest trend in type 2 diabetes in Asia and its associated risk factors in an attempt to contribute to the goal of preventing and controlling NCDs in 2025.

Design And Method

Study design, setting, and population

This is a correlational analytical study that aims to explore the burden of type 2 diabetes in Asia from 1990 to 2019. Incidence, prevalence, YLLs (years that a person might have lived, but were lost due to premature death). YLDs (the number of years one has been incapacitated or disabled due to illness, and DALY (a type of health index that combines years of life lost due to premature death induced by non-fatal diseases. This index was defined and used in the Global Disease and Injury (GBD) study to calculate disease burden) were defined and utilized based on age and sex from 1990 to 2019. Data on type 2 diabetes in Asia are available from GBD 2019. Data were extracted from the website (https://vizhub.healthdata.org/gbd-compare/) and subjected to analysis. In this study, the relationship between diabetes burden and human development index (HDI) was considered. HDI is estimated annually for all developing and developed countries and is publicly available on the World Health Organization (WHO) website for researchers.

Countries are divided into several groups based on the level of HDI including countries with very high human development, countries with high human development, countries with medium human development and countries with low human development. The numerical value of the HDI ranges from zero and one. The value of HDI manifests how far a country has succeeded in achieving the highest possible value, one, and allows the comparison of countries. The HDI is a summary of human development measures. This index measures the average success of a country in three main dimensions of human development, i.e. long and healthy life, education and living standards.

Statistical analysis

In this study, the two-variable correlation method was used for data analysis in order to investigate the correlation between burden of diabetes mellitus type 2 and HDI. The significance level was set to $P < 0.05$. Data analysis was conducted using Stata software version 12 (Stata Corp, College Station, TX, USA)

Results

According to the Figure 1, the Americas has the highest incidence, mortality and DALY of type 2 diabetes in the world. Asia is ranked third in the world in terms of type 2 diabetes with an incidence of 280.59 per 100,000 people, mortality of 18.06 per 100,000 people and a DALY of 836.16 per 100,000 population ***Figure 2*** displays the incidence, death and morbidity of type 2 diabetes in different parts of the world. As can be seen, high-income areas in 1990 and 2019 were ranked first in the incidence of type 2 diabetes. As regards death rates, Latin America and the Caribbean ranked first in death and DALY of type 2 diabetes in 1990 and 2019.

Figure 3 shows the incidence and death of type 2 diabetes in Asia. As depicted, the incidence and death of type 2 diabetes has taken an upward trend and the incidence of type 2 diabetes has risen from 146.5 per 100,000 in 1990 to 280.5 in 2019 while the death rate of the disease has climbed from 8.6 per 100,000 to 18.06 in 2019.

The analysis of the burden of type 2 diabetes in Asia reveals its upward trend in Asia from 1990 to 2019, so that YLD climbed from 189.3 per 100,000 in 1990 to 438.9 per 100,000 in 2019. The YLD has also risen from 213 per 100,000 in 1990 to 397.1 per 100,000 in 2019, and DALY has surged from 402.3 per 100,000 in 1990 to 836.1 per 100,000 in 2019.

The results showed that the burden of diabetes increased from 1990 to 2019 in men and women, and since 2005 this trend has been slightly higher in men than in women (Fig 5).

The chart below (Fig. 6) manifests the distribution of disease burden by age and sex. As can be seen, diabetes burden has increased by aging in women and men. In men of all age groups, the burden of diabetes is higher than women. In women, the disease burden has taken a downturn at the age of 84, and in men, this downturn has appeared from the age of 89 onwards.

The results of the study showed that according to the estimated statistics, the highest incidence of type 2 diabetes in 2019 was in Bahrain (99.44 per 100,000), Qatar (835.02 per 100,000) and Brunei (697.38 per 100,000), respectively. The highest deaths of type 2 diabetes in Asia in 2019 were registered in Sri Lanka (58.29 per 100,000), Bahrain (48.53 per 100,000) and Armenia (39.14 per 100,000), respectively. The highest prevalence of type 2 diabetes was also reported in Bahrain (12965.2 per 100,000) and Georgia (11382.4 per 100000), respectively (Table1).

According to type 2 diabetes statistics in Asia in 2019, the highest YLL index was reported in Bahrain (1133.19 per 100,000), Sri Lanka (1132.1 per 100000), respectively. The highest YLD of type 2 diabetes was related to Sri Lanka (1043.85 per 100000) and Bahrain (1027.242 per 100000), respectively, and the highest DALY was reported in Sri Lanka (2175.96 per 100000) and Bahrain (2175.46 per 100000) (Table2).

The analysis of the global distribution of type 2 diabetes based on the level of development suggested that the highest DALY of type 2 diabetes is related to high SDI regions, which accounts for 24% of the DALY of type 2 diabetes in the world. The highest incidence of type 2 diabetes (28% of the total global incidence of type 2 diabetes) is also related to high SDI regions and the highest reported death of this disease (25% of the total deaths related to type 2 diabetes in the world) is reported middle SDI regions (Fig7).

In examining the relationship between HDI and the incidence and death of type 2 diabetes in Asia, the results revealed that the incidence of type 2 diabetes in men ($r=0.481$, $P<0.05$) and women ($r=0.414$, $P<0.05$) was positively and significantly correlated with HDI, while the observed correlation between death and HDI in women and men was not significant ($P>0.05$) (Fig. 8).

Figure 9 shows the association between the burden of type 2 diabetes and HDI in Asia in 2019. As can be seen, there is a positive and significant correlation between YLD and HDI ($r = 0.541$, $P <0.05$). The results demonstrated that the relationship of DALY and YLD with HDI was not significant ($P> 0.05$).

Figure 10 shows the distribution of risk factors for type 2 diabetes by age group in Asia in 2019. As is shown, in all age groups, metabolic factors have the largest share in all three indices of DALY, YLD and YLL in type 2 diabetes and aging reinforces the impact of all three factors (metabolic, environmental and behavioral) on DALY, YLL, and YLD.

The following diagram exhibits the effect of metabolic, behavioral and environmental risk factors on the DALY in women and men. As can be seen, the highest share of risk factors related to the DALY in men (120.2.2 per 100,000) and women (7122.4 in 100000) is related to behavioral factors (Fig.11)

In examining risk factors of disease burden in men and women in Asia, the results revealed that air pollution, high fasting plasma glucose, and dietary risks are the highest risk factors associated with the burden of type 2 diabetes in men and women, respectively (Fig12).

Discussion

According to the results, the highest incidence of diabetes is related to Sri Lanka (21175.96 per 100000) and Bahrain (21175.46 per 100000). The results also demonstrate the positive and significant correlation between the incidence of type 2 diabetes in men ($r=0.481$, $P<0.05$) and women ($r=0.414$, $P<0.05$) and HDI. A positive and significant correlation was observed between YLD and HDI ($r=0.541$, $P<0.05$). As suggested by the results, the highest prevalence of type 2 diabetes in Asia is related to Bahrain (12965.2 per 100,000) and Georgia (11382.4 per 100000). Moreover, according to our findings, air pollution, high fasting plasma glucose and dietary risks are the highest risk factors associated with the burden of type 2 diabetes in men and women, respectively.

The prevalence of type 2 diabetes is rising worldwide. The overall burden of the disease is relatively higher in low- and middle-income countries because these regions are home to the largest number of patients with type 2 diabetes and this trend is expected to maintain its upward movement[10]. It is predicted that by 2045 the highest incidence of the disease will be in low- and middle-income countries with an estimated prevalence of 7.3 to 18.5% (compared to 4.8 to 12.6% in high-income countries)[10].

In low- and middle-income countries, a large share of cases go detected compared to high-income countries. Large regional variation in the proportion of undiagnosed cases in each country may be associated with a lack knowledge about the disease. Therefore, low- and middle-income countries are advised to raise public awareness and initiate active diabetes screening programs[11].

Oulabi et al. found that most national guidelines for low- and middle-income countries are inadequate in terms of application, transparency, and dissemination program, with lower economic or social efficiency compared to high-income countries[12]. The introduction of practical and enforceable national guidelines is likely to improve clinical outcomes and reduce the observed death gap between countries with different economic statuses.

The results of the present study disclosed that the highest burden of type 2 diabetes is related to high SDI regions. Also, the highest incidence of type 2 diabetes is related to high SDI regions and the highest reported death of disease is related to middle SDI areas.

Studies on the prevalence of diabetes worldwide are widely heterogeneous. Different study periods, geographical areas, populations, age range and diagnostic methods are among the factors that may explain divergent prevalence in different regions[13].

The estimated global prevalence of diabetes has almost doubled since 1990[5]. People in low-, middle- and middle-income SDI regions are more likely to develop type 2 diabetes due to socioeconomic change that is characterized with increased food supply, adoption of Western diet and reduced physical activity. Hence, effective interventions must be taken to change the unhealthy lifestyle [14, 15].

In China, DALYs has climbed by 95% from 1990 to 2016 and standardized DALY rates have increased by 2.3%[16]. In the Eastern Mediterranean region, total DALY has soared by 191.3% from 1990 to 2015[17].

According to Lin et al., there were more than 67 million DALY of diabetes in 2017. Standard rates of DALYs for type 2 diabetes exhibit an upward trend, and there were 706 million DALYs worldwide attributable to NCDs in 2017 so that diabetes was one of the top five leading causes of NCDs linked to DALYs[18]. Several studies have reported that DALYs of

diabetes are on the rise in developing countries. In India, diabetes ha induced the highest surge in DALY rates among NCDs from 1990 to 2016 with a standardized surge of 39.6%[19]. The present study showed that the burden of diabetes, YLL and YLD has increased from 1990 to 2019.

The findings of Cheema et al. suggested with sustained population aging in the future, the overall burden of diabetes will also rise and necessary measures and policies must be taken to prompt effective responses to this increased burden[20].

Several factors are involved in type 2 diabetes, including biological, environmental, behavioral, and social factors, which complicate the assessment of the relationship between DALYs and SDIs[21].

The present study showed that the highest share of risk factors of DALY in men (12093.2 per 100000) and in women (7122.4 per 100000) is related to behavioral factors. The results revealed that in all age groups, metabolic factors have the largest share in all three indices of DALY, YLD and YLL in type 2 diabetes and these factors are exacerbated with age.

As regions with low-, middle- and intermediate SDI experience rapid economic growth, dietary patterns and lifestyles undergo dramatic changes. However, they do not have the infrastructure required to support a healthy lifestyle, and current health services are unable to diagnose diabetes early so that timely interventions can be made. Intensive measures should be planned and implemented in less developed countries to hamper a further surge in the DALY of diabetes and to strengthen health care services.

Most developing countries are abandoning traditional diets in favor of more carbohydrates, fats and sugars. Globalization and emerging supermarkets are facilitating access to processed, high-fat, high-sugar, high-salt foods. Relatively low prices and high availability of low-nutrient foods reduce the intake of grains, fruits and vegetables[22].

In developing countries, the government can offer more incentives to buy whole grains, nuts and seeds, fruits and vegetables, and impose restrictions on less healthy products.

The standard rate for age-related DALYs of particle pollution has increased by 65.4% over the past 28 years. Although global air pollution caused by the use of solid fuel in households has dropped, it is still a major risk factor in countries with low and middle SDI. Environmental and domestic air pollution may alter lung function, vascular homeostasis, and insulin sensitivity, leading to abnormal glucose homeostasis[23].

Conclusion

This study demonstrated the burden of type 2 diabetes in Asian countries and its results can provide necessary insights to prioritize and plan health services to achieve the WHO's Global Action Plan for the Prevention and Control of NCDs in 2025. In light of the fact that diabetes is often increased by modifiable risk factors, governments and organizations in different countries, especially in countries with high prevalence and burden of this disease, are required to make policy, allocate medical resources and modify clinical guidelines for diabetes education to change unhealthy lifestyles, carry out effective screening of overweight and obese people to reduce the incidence of diabetes by providing solutions and adjust public lifestyle. On the other hand, because air pollution is one of the risk factors associated with the burden of diabetes, it is essential to formulate policies to reduce environmental and indoor air pollution. Thus, disease management programs and public initiatives can improve the outcome of type 2 diabetes, especially in countries where it is most needed.

Limitations

Given that the present study is based on global burden of disease data (GBD, 2019), the bias in the classification of diabetes must be taken into account. This is due to the fact that such reports rarely distinguish between type 1 and type 2 diabetes because it requires relatively complex laboratory tests to assess pancreatic function. Mortality estimated by GBD

is based on diabetes certifications, which may underestimate the deaths associated with diabetes. In fact, diabetes is closely linked to the elevated risk and death of cardiovascular and cerebrovascular diseases, cancer, and infectious diseases, which can increase the rate of indirect mortality. In addition, a comparison of the burden of diabetes is challenging due to the huge discrepancy in accessing health services, quality of care, and data quality between countries, and caution must be exercised in interpreting conclusions in a particular region.

Abbreviations

HDI: HDI

NCDs: non-communicable diseases

GNI: gross national income

LEB: life expectancy at birth

GDP: gross domestic product

Declarations

Ethics approval and consent to participate;

This study was approved by the ethics committee of Lorestan University of Medical Sciences, Ethics Committee (number: IR.LUMS.REC.1399.219, date: 2020.11.16).

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Not applicable

Consent for publication

Not applicable

Availability of data and materials

The datasets of the present study can be provided by the corresponding author upon reasonable request.

Competing interests

The authors declare that they have no conflict of interest.

Authors' contributions

Design: E.G., V.M., Z.K., Data Collection and/or Processing: E.G., A.B., Analysis or Interpretation: E.G., Z.K., Literature Review: E.G, .S.R, Writing: E.G.,A.B, S.R V.M., Z.K.

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Tables

Table1- Incidence and prevalence of type 2 diabetes, according to sex in Asian countries

Asian countries	Incidence per 100000			Death per 100000			Prevalence per 100000		
	Both	Female	Male	Both	Female	Male	Both	Female	Male
Afghanistan	252.19	286.79	219.34	11.31	17.53	5.41	3630.64	4292.02	3002.86
Armenia	330.71	357.87	301.60	39.14	45.49	32.35	7135.14	7950.43	6261.27
Azerbaijan	298.60	321.02	276.19	19.00	20.96	17.05	5487.96	6063.51	4912.98
Bahrain	996.44	838.62	1092.41	48.53	53.64	45.42	12965.21	11185.74	14047.21
Bangladesh	211.51	211.25	211.78	19.24	19.86	18.60	4055.30	4015.50	4096.17
Bhutan	231.61	223.49	239.08	19.47	20.44	18.58	4262.95	4163.72	4354.28
Brunei	697.38	578.96	804.97	37.19	35.03	39.15	10462.12	8916.10	11866.85
Cambodia	262.54	269.82	254.99	20.19	22.95	17.32	4232.05	4511.81	3942.01
China	262.88	260.00	265.66	11.84	12.22	11.48	6328.79	6013.81	6631.91
Georgia	378.98	364.24	395.03	20.58	19.23	22.03	11382.43	10787.74	12015.69
India	302.48	282.13	321.81	18.62	18.61	18.62	5885.54	5526.91	6226.23
Indonesia	243.46	238.91	247.93	38.03	39.23	36.85	3883.71	3850.95	3915.88
Iran	345.78	363.72	328.40	16.83	18.48	15.24	5972.88	6269.08	5685.93
Iraq	344.32	356.38	332.82	21.46	21.57	21.35	5532.81	5865.38	5215.95
Israel	277.37	283.38	271.31	27.86	29.42	26.28	5529.40	5771.61	5285.01
Japan	241.67	198.36	287.24	6.68	6.66	6.71	6856.60	5736.02	8035.62
Jordan	330.17	282.34	371.90	17.19	17.45	16.97	5088.19	4347.66	5734.28
Kazakhstan	311.37	360.07	259.53	13.25	16.43	9.87	6165.86	7553.27	4688.86
Kuwait	544.82	464.66	614.30	8.01	6.28	9.50	8489.24	6980.27	9796.91
Kyrgyzstan	140.92	147.57	134.12	4.50	5.00	3.99	2632.69	2897.48	2362.22
Lao People's Democratic Republic	272.72	287.25	258.35	20.11	23.34	16.91	4292.50	4589.11	3998.95
Lebanon	390.89	377.22	404.99	15.86	12.48	19.34	7756.97	7630.34	7887.66
Malaysia	332.82	342.42	323.87	10.33	11.19	9.52	5797.03	6009.54	5598.80
Maldives	231.55	223.90	236.60	9.71	10.09	9.46	3604.10	3671.05	3559.86
Mongolia	104.08	100.80	107.46	3.35	2.51	4.21	1838.69	1876.62	1799.73
Myanmar	330.53	366.80	291.40	38.16	36.16	40.31	5328.96	6108.49	4487.86
Nepal	223.39	208.84	239.37	10.67	10.02	11.38	4440.84	3999.12	4925.85
Oman	325.51	277.27	352.10	14.00	17.43	12.11	4205.32	3931.67	4356.21
Pakistan	220.89	221.09	220.71	20.07	22.55	17.70	3769.04	3684.39	3849.53
Philippines	209.58	230.81	188.93	23.22	23.68	22.77	3259.78	3725.18	2807.26
Qatar	835.02	728.73	871.18	11.71	14.99	10.60	9575.36	8439.28	9961.89

Saudi Arabia	473.53	428.65	505.54	7.83	6.92	8.48	6958.35	6307.34	7422.83
Singapore	359.14	293.07	422.35	3.09	3.20	2.98	7709.25	6455.36	8908.74
Sri Lanka	623.22	634.32	611.35	58.29	60.89	55.52	10741.96	11405.11	10032.97
Syrian Arab Republic	356.36	356.51	356.21	11.03	11.44	10.60	6255.85	6063.12	6458.83
Tajikistan	230.40	236.98	223.96	15.58	15.47	15.67	3736.81	3912.98	3564.50
Thailand	359.84	363.20	356.30	26.16	29.16	23.00	6777.48	6917.31	6630.75
Timor-Leste	198.75	193.68	203.70	13.18	15.87	10.56	3191.07	3107.28	3272.91
Turkey	317.49	317.94	317.05	23.15	27.03	19.34	5672.28	5811.62	5535.82
Turkmenistan	216.98	224.26	210.00	12.99	14.17	11.85	4195.66	4654.96	3755.60
United Arab Emirates	691.00	537.01	749.05	13.33	9.71	14.70	7782.55	6362.53	8317.85
Uzbekistan	254.98	249.62	260.36	21.35	22.19	20.51	4104.89	4176.41	4033.11
Viet Nam	290.98	302.98	278.76	28.78	34.42	23.03	4514.43	4891.28	4130.66
Yemen	154.06	159.29	148.95	5.14	6.23	4.08	2347.71	2430.65	2266.62
Republic of Korea	242.22	245.65	238.75	23.62	24.02	23.23	5263.27	5525.12	4998.80
Democratic People's Republic of Korea	242.22	245.65	238.75	14.69	18.34	11.01	5263.27	5525.12	4998.80

Table2- Distribution of YLL, YLD and DALY diabetes mellitus type 2 in 2019 by country in Asia

Asian countries	YLL			YLD			DALY		
	Both	Female	Male	Both	Female	Male	Both	Female	Male
Afghanistan	309.74	485.61	142.81	270.32	322.01	221.25	580.06	807.62	364.06
Armenia	815.99	895.56	730.70	649.80	736.52	556.85	1465.79	1632.08	1287.55
Azerbaijan	482.83	513.25	452.44	482.78	541.67	423.95	965.62	1054.93	876.39
Bahrain	1133.19	1150.96	1122.38	1042.27	922.26	1115.24	2175.46	2073.22	2237.62
Bangladesh	358.05	381.96	333.49	330.09	320.03	340.42	688.14	701.99	673.91
Bhutan	382.90	403.08	364.32	349.95	338.80	360.22	732.85	741.88	724.54
Brunei	913.66	803.08	1014.13	813.30	707.22	909.69	1726.96	1510.30	1923.82
Cambodia	485.56	522.62	447.14	372.70	398.01	346.46	858.26	920.63	793.60
China	234.65	230.15	238.99	440.52	419.59	460.66	675.18	649.74	699.65
Georgia	709.92	667.80	755.75	862.34	806.04	922.30	1274.34	1162.76	1393.15
India	401.27	392.77	409.34	462.54	433.69	489.94	863.81	826.45	899.29
Indonesia	1029.99	1043.26	1016.95	340.66	334.27	346.94	1370.65	1377.53	1363.90
Iran	337.21	358.03	317.05	512.70	540.44	485.82	849.91	898.47	802.87
Iraq	519.08	512.05	525.78	431.09	462.85	400.83	950.17	974.90	926.61
Israel	404.53	378.89	430.41	418.06	437.61	398.33	822.59	816.50	828.74
Japan	91.95	74.13	110.70	587.57	502.99	676.56	679.52	577.13	787.26
Jordan	367.70	351.81	381.56	376.64	337.79	410.54	744.34	689.60	792.11
Kazakhstan	292.14	340.76	240.37	542.93	675.92	401.35	835.07	1016.68	641.73
Kuwait	158.38	123.19	188.87	644.20	535.82	738.12	802.57	659.01	926.98
Kyrgyzstan	120.00	126.28	113.59	225.67	252.49	198.28	345.67	378.77	311.87
Lao People's Democratic Republic	509.10	568.52	450.29	373.99	397.36	350.87	883.09	965.88	801.16
Lebanon	295.10	234.75	357.39	704.19	698.33	710.23	999.29	933.08	1067.62
Malaysia	240.15	248.84	232.04	485.90	505.59	467.53	726.05	754.43	699.57
Maldives	205.62	204.52	206.34	307.80	315.80	302.52	513.42	520.31	508.86
Mongolia	101.21	67.94	135.39	155.04	161.51	148.39	256.25	229.44	283.78
Myanmar	910.39	799.43	1030.11	472.36	540.33	399.01	1382.75	1339.77	1429.13
Nepal	212.39	169.22	259.79	363.47	323.09	407.80	575.86	492.31	667.59
Oman	323.69	398.33	282.53	317.50	307.88	322.81	641.19	706.20	605.34
Pakistan	493.02	554.28	434.76	323.63	306.28	340.14	816.65	860.56	774.90
Philippines	583.46	541.27	624.48	288.47	329.18	248.89	871.93	870.46	873.37
Qatar	283.29	340.17	263.93	718.42	649.68	741.80	1001.71	989.86	1005.74

Saudi Arabia	223.81	200.07	240.75	463.38	421.88	492.99	687.20	621.95	733.75
Singapore	56.21	52.54	59.72	615.45	502.84	723.18	671.66	555.37	782.90
Sri Lanka	1132.10	1099.45	1167.02	1043.85	1100.65	983.13	2175.96	2200.10	2150.15
Syrian Arab Republic	246.48	251.53	241.15	504.46	491.34	518.28	750.94	742.87	759.43
Tajikistan	427.62	418.23	436.82	319.35	338.94	300.20	746.98	757.17	737.02
Thailand	569.27	587.99	549.62	619.50	629.34	609.17	1188.77	1217.33	1158.80
Timor-Leste	304.26	360.36	249.48	284.30	275.01	293.37	588.56	635.37	542.84
Turkey	430.82	464.56	397.77	516.44	547.09	486.43	947.26	1011.65	884.20
Turkmenistan	366.85	388.51	346.10	360.15	407.10	315.16	727.00	795.61	661.26
United Arab Emirates	407.00	272.24	457.81	544.55	454.56	578.48	951.56	726.80	1036.28
Uzbekistan	582.87	590.94	574.77	353.86	364.69	342.98	936.72	955.62	917.75
Viet Nam	594.24	642.30	545.30	409.88	444.72	374.40	1004.12	1087.01	919.70
Yemen	124.45	151.34	98.16	182.43	190.38	174.66	306.88	341.72	272.81
Republic of Korea	394.50	334.01	453.73	589.32	570.96	607.30	983.82	904.96	1061.03
Democratic People's Republic of Korea	335.86	387.77	283.43	420.48	449.33	391.34	756.34	837.10	674.77

Figures

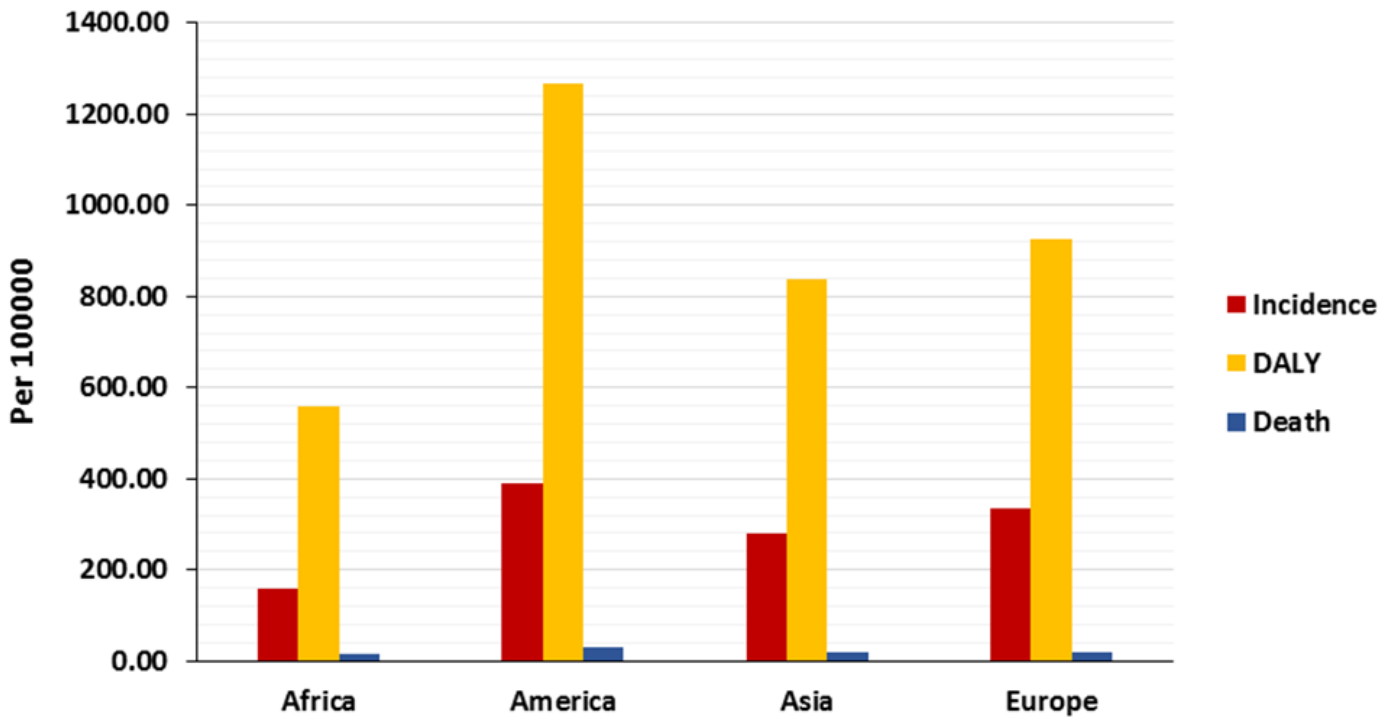


Figure 1

Distribution of Incidence, Death and DALY of diabetes mellitus type 2 by continent

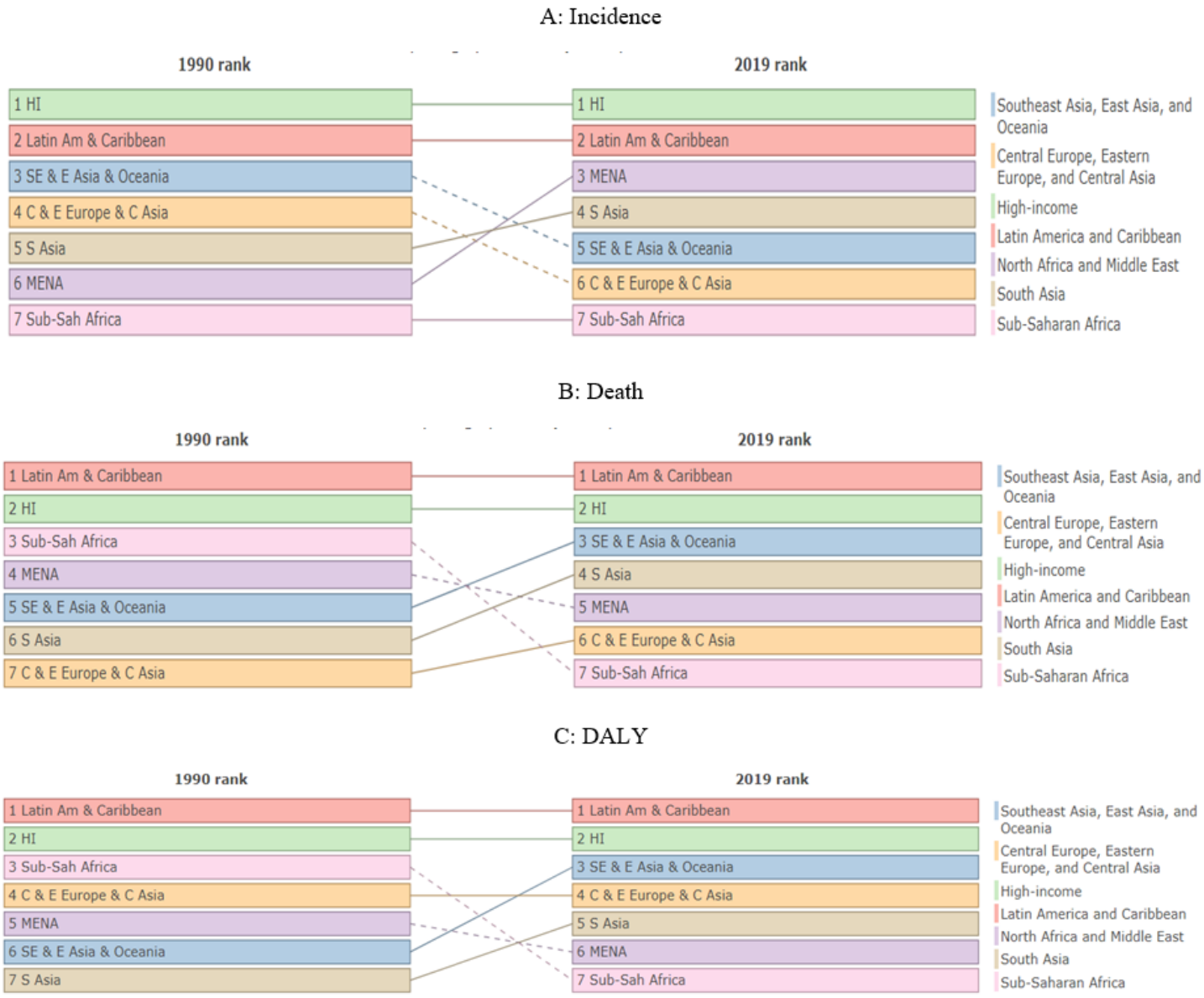


Figure 2

Rank of A:Incidence, B: Death and C: DALY of diabetes mellitus type 2 in the world in 2019

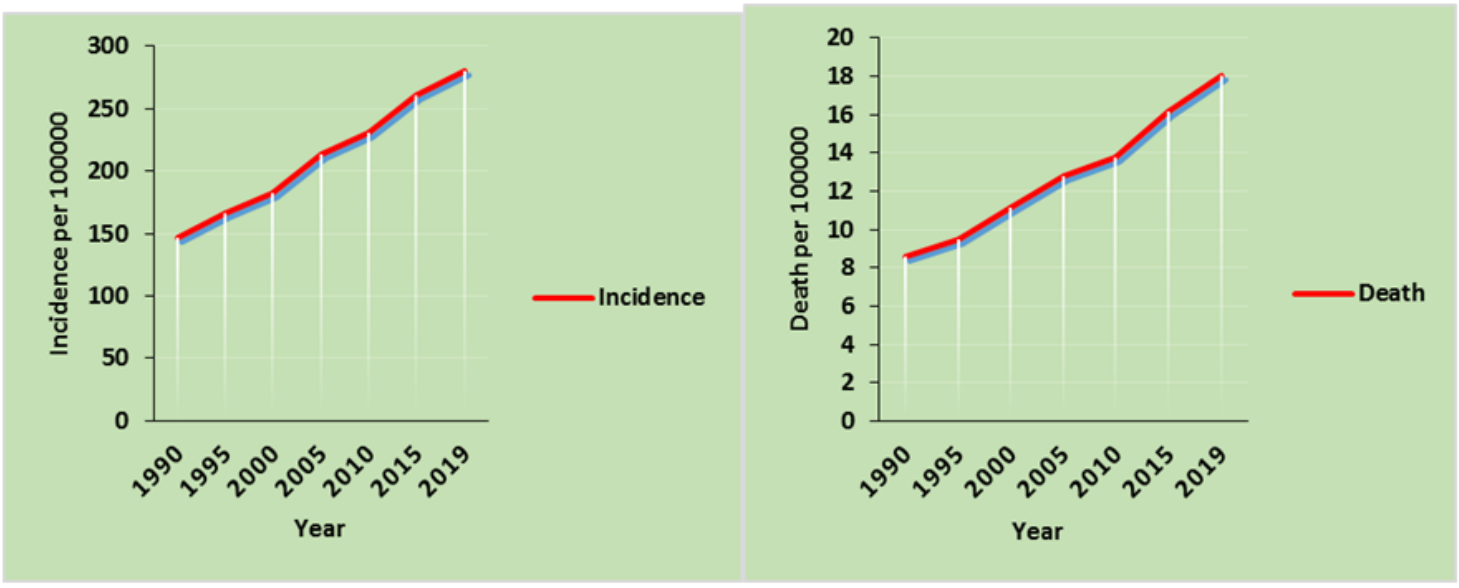


Figure 3

Trend of incidence and death of diabetes mellitus type 2 during 1990-2019 in Asia

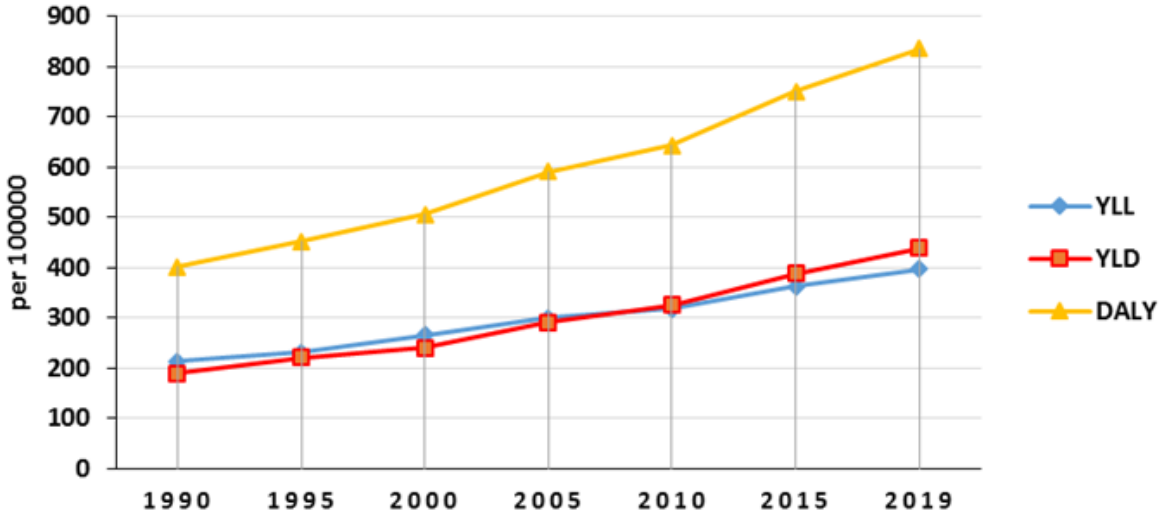


Figure 4

Trend of DALY, YLL and YLD of diabetes mellitus type 2 during 1990-2019 in Asia

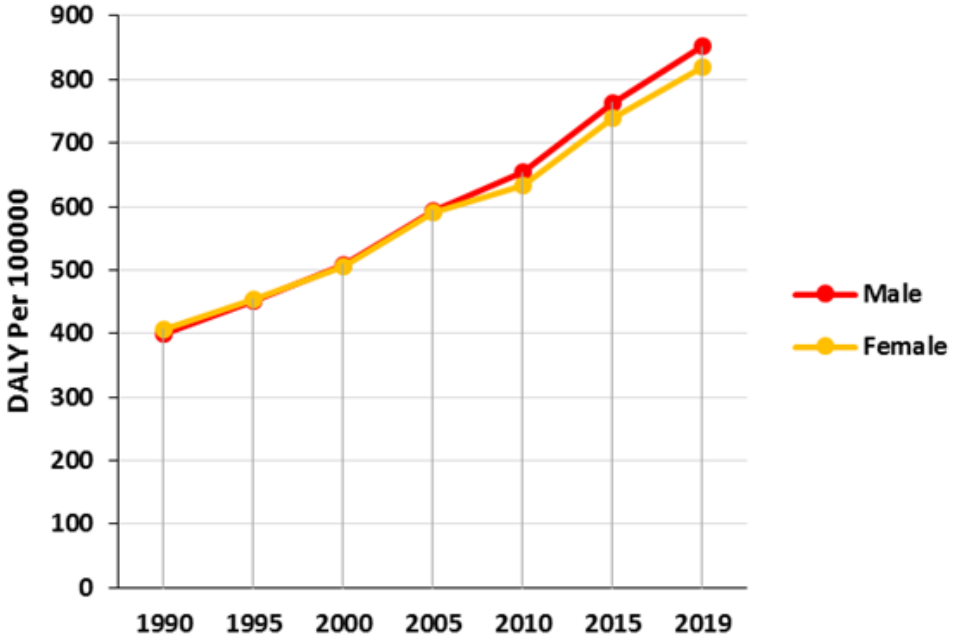


Figure 5

Trend of DALY of diabetes mellitus type 2 during 1990-2019 in Asia by sex

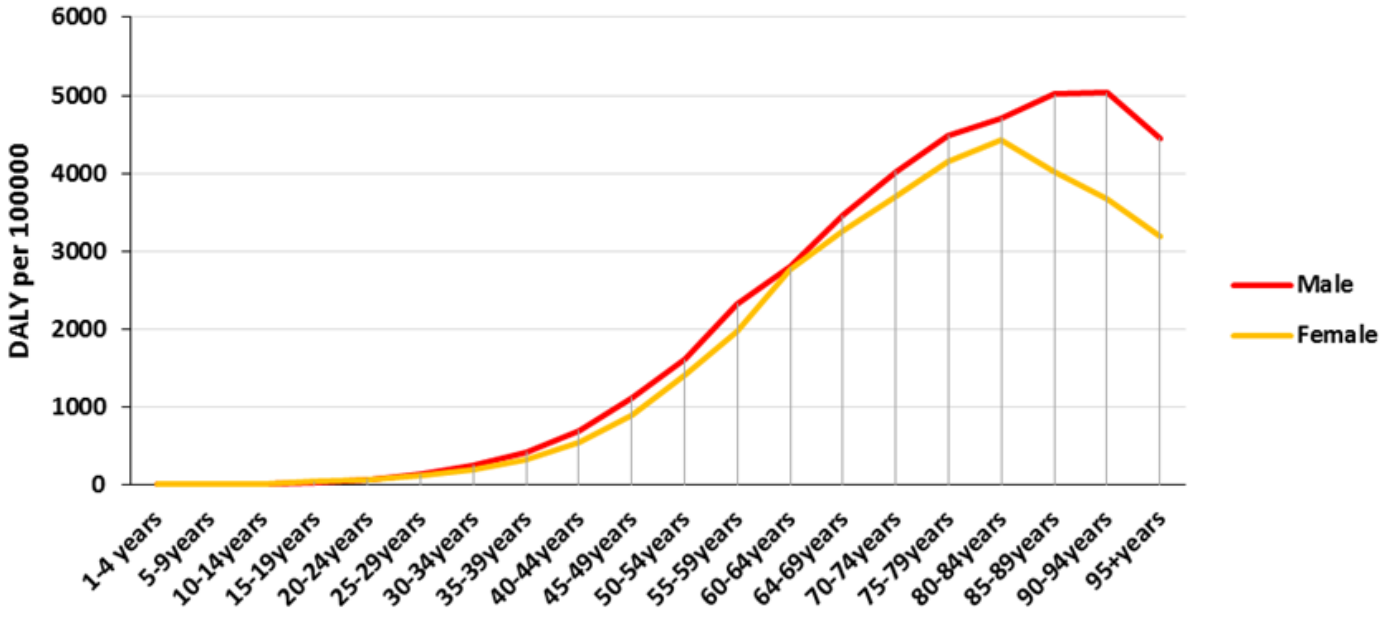


Figure 6

Trend of DALY of diabetes mellitus type 2 in Asia by sexes and age

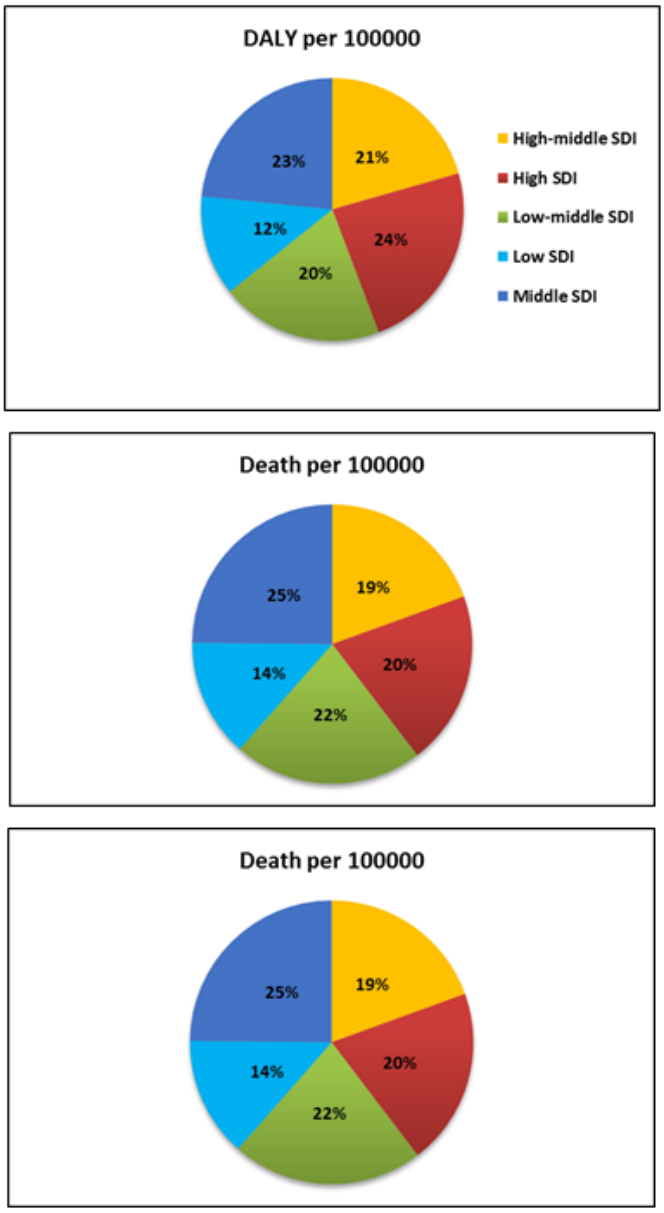
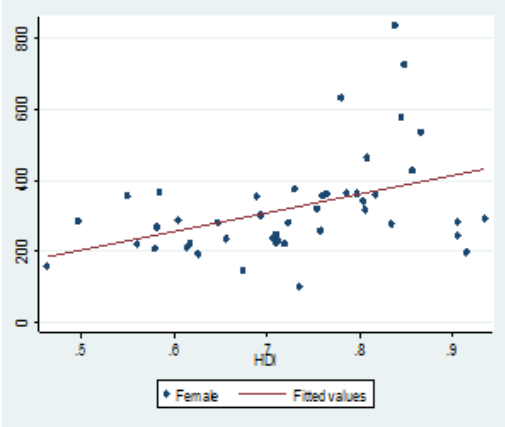


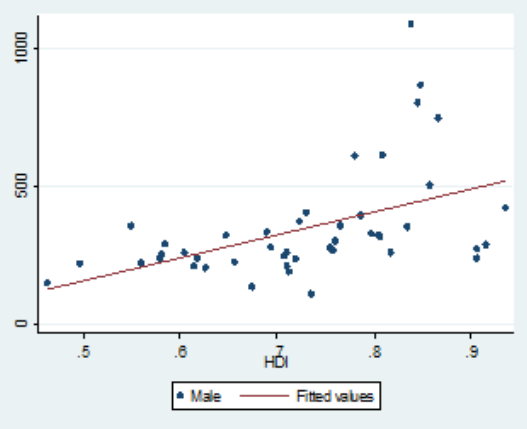
Figure 7

Distribution of Incidence, Death and DALY of diabetes mellitus type 2 by SDI level

A: Incidence



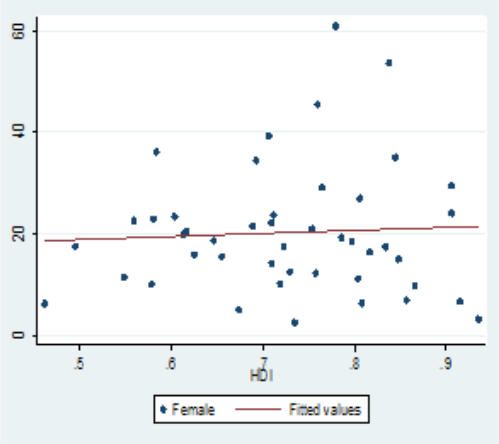
R Sq. linear=0.414, P<0.05



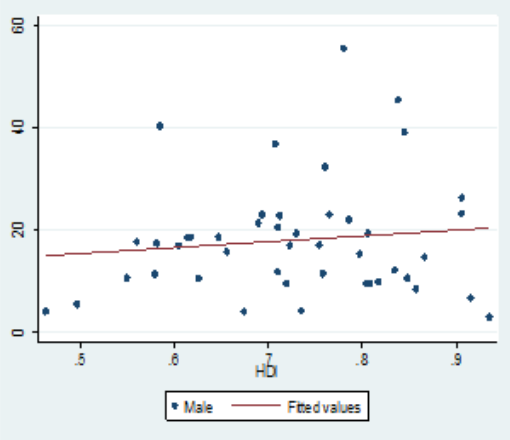
R Sq. linear=0.481, P<0.05

R Sq. linear = 0.481, P <0.05 R Sq. linear = 0.414, P <0.05

B: Death



R Sq. linear=0.055, P>0.05



R Sq. linear=0.116, P>0.05

Figure 8

Correlation of HDI with A: Incidence, B: Death of diabetes mellitus type 2 in Asia in 2019

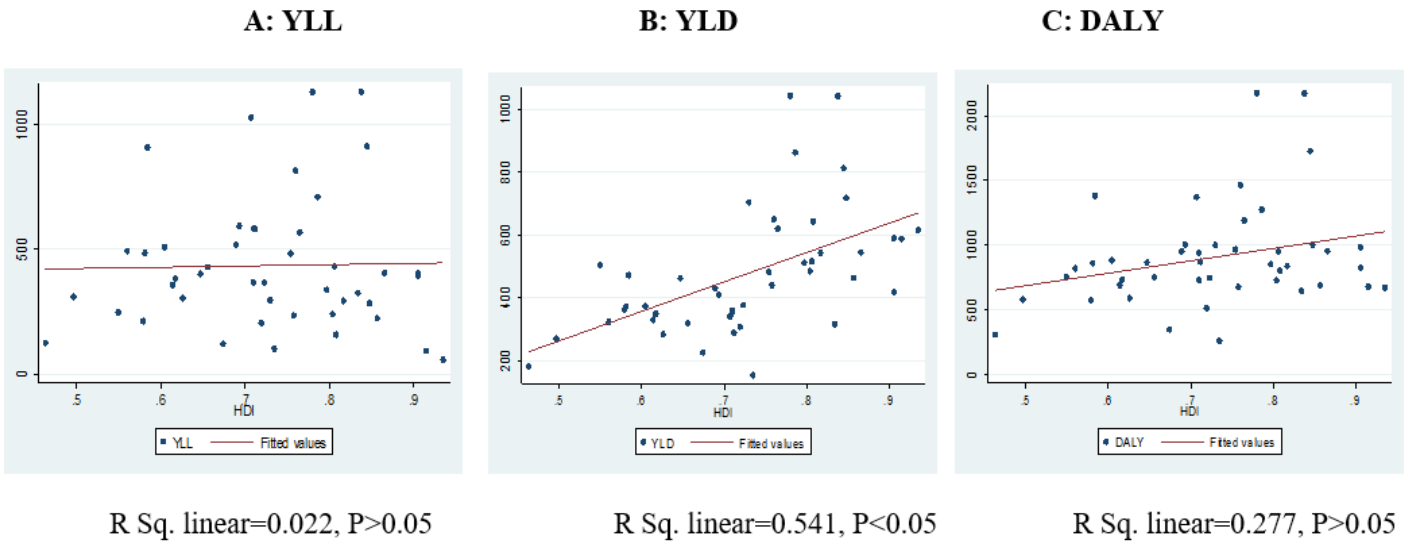


Figure 9

Correlation of HDI with A: YLL, B: YLD, C: DALY of diabetes mellitus type 2 in Asia in 2019

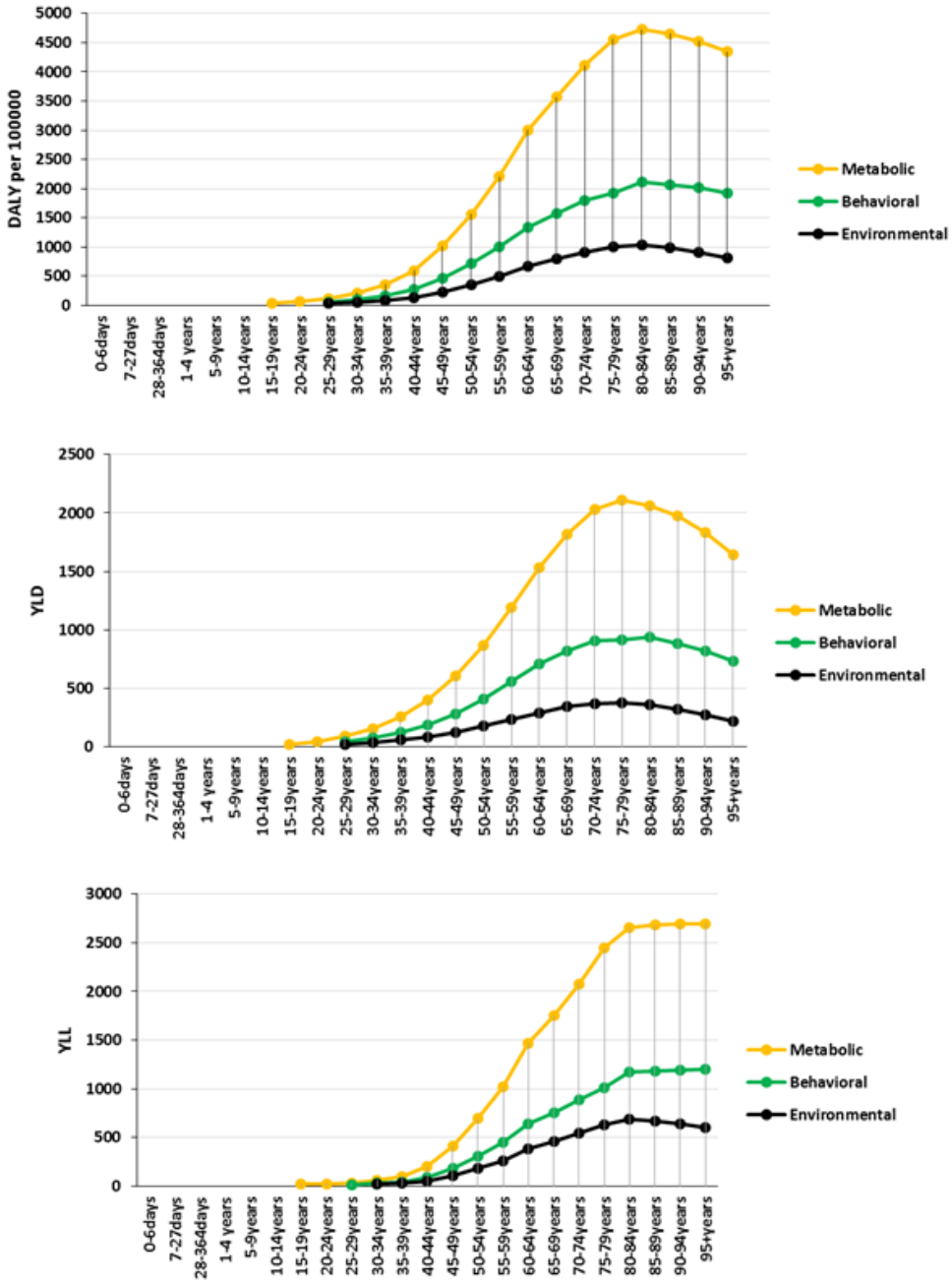


Figure 10

Distribution of risk factor of diabetes mellitus type 2 by age group in Asia in 2019

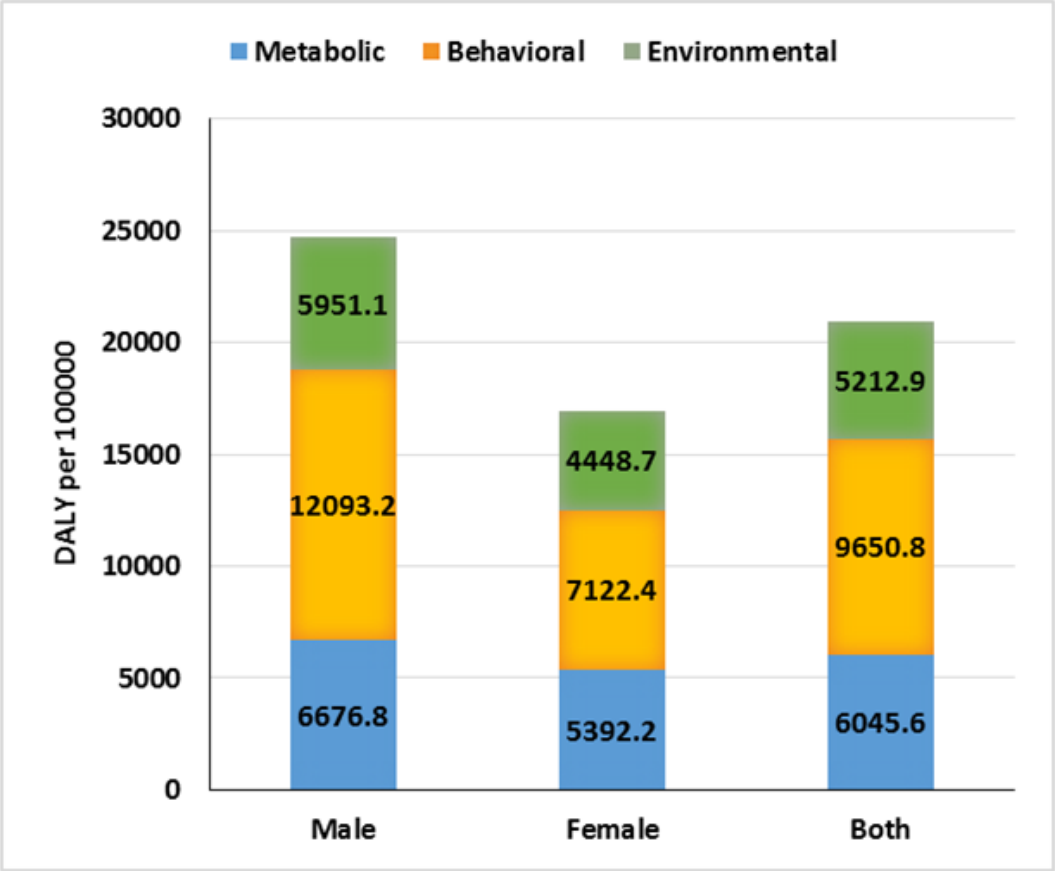


Figure 11

Distribution of risk factor of diabetes mellitus type 2 by sex in Asia in 2019

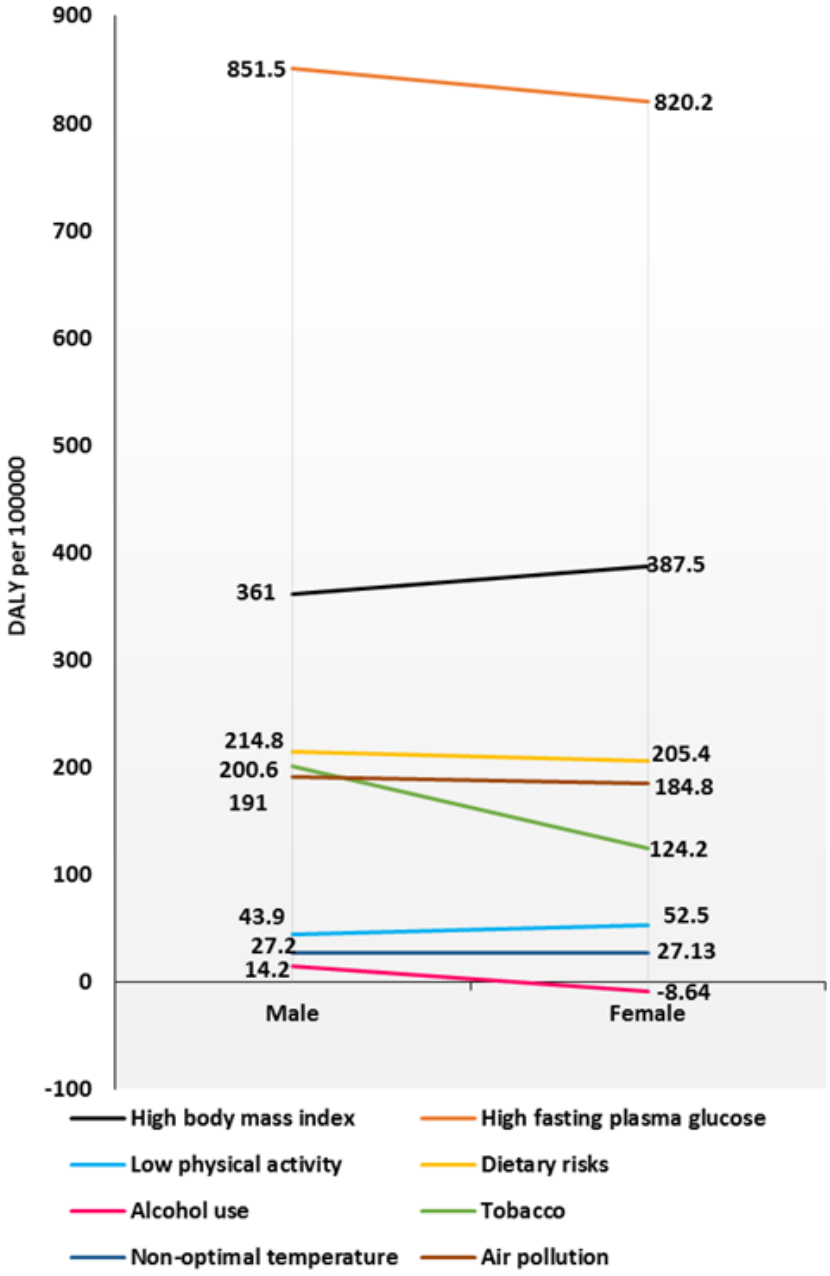


Figure 12

Risk factors associated with the burden of type 2 diabetes