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The burden of depression, anxiety and schizophrenia among the older population in ageing and aged countries: an analysis of the Global Burden of Disease Study 2019

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ABSTRACT

Background Depression, anxiety and schizophrenia among older persons have become global public health challenges. However, the burden of these disorders in ageing and aged countries has not been analysed.

Aims To investigate the burden of depression, anxiety and schizophrenia among older adults in ageing and aged countries.

Methods Using data from the Global Burden of Disease Study 2019, we calculated the estimated annual percentage change (EAPC) in the age-standardised incidence rates (ASIR) and age-standardised disability-adjusted life years (DALYs) rates (ASDR) for depression, anxiety and schizophrenia of older people in ageing countries (China, India, Indonesia) and aged countries (Japan, Italy, Portugal) between 1990 and 2019. Trends in incidence and DALYs were analysed by gender and age.

Results In 2019, the highest incidence of depression, anxiety and schizophrenia in the older population in aged countries was in Japan (927 271.3 (752 552.3–1 125 796.5), 51 498.2 (37 625.7–70 487.3) and 126.0 (61.0–223.2), respectively), while the highest incidence in ageing countries was in China (5 797 556.9 (4 599 403.4–7 133 006.5), 330 256.1 (246 448.9–445 987.4) and 1067.7 (556.2–1775.9), respectively). DALYs for these disorders were similar, with the highest in Japan and China. From 1990 to 2019, the ASIR for depressive disorders decreased in aged countries but increased in ageing countries; the ASIR for anxiety disorders and schizophrenia declined in both ageing and aged countries. The ASDR for depressive disorders was consistent with the ASIR but not for anxiety disorders and schizophrenia. The ASIR for depressive disorders was higher in older women, while the opposite was observed in anxiety disorders and schizophrenia. Notably, the conditions of burden of depressive disorders, anxiety disorders and schizophrenia in the 65–70-year-old age group were the most burdensome.

Conclusions The incidence and DALYs of these three mental disorders increased while exhibiting differences between ageing and aged countries. Raising awareness about formulating health policies for preventing and treating mental disorders in the older population is necessary to reduce the future burden posed by the ageing challenge.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The global population is ageing. However, the burden of depressive disorders, anxiety disorders and schizophrenia among older people in ageing and aged countries has not been clearly elucidated.

WHAT THIS STUDY ADDS

⇒ Depressive disorders, anxiety disorders and schizophrenia impose a crucial burden on the older population in ageing and aged countries.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The current study underscores the importance of directing future policies towards strengthening mental health, specifically emphasising the older population.

INTRODUCTION

Mental disorders have become a growing public health concern worldwide, associated with an increased risk of disability and mortality.[1] Among 12 mental disorders, depressive and anxiety disorders account for the highest proportion of the global burden of diseases at 37.4% and 22.9%, respectively, followed by schizophrenia at 12.1%.[2] Today, the worldwide ageing population is growing rapidly. According to the United Nations (UN) regulations, if the proportion of adults aged 65 or older exceeds 7%, it is defined as an ageing population. Similarly, proportions exceeding 14%, 21% and 28% are defined as aged, super-aged and ultra-aged, respectively. In 2019, one in 11 people worldwide was over 65, and the population aged 65 and above exceeded 703 million. By 2050, this figure is

projected to double, with one in six people being over 65.[3] The associated global public health burden is substantial.[4] Notably, the general accelerated ageing trend poses an increased risk of mental illness, with depression, anxiety and schizophrenia emerging as prevalent mental health conditions among older adults around the world.[5–8]

As developing societies, China, India and Indonesia were the most populous countries in the world in 2019, with a population of 1.43 billion, 1.37 billion and 270 million, respectively.[4] The proportion of China's population aged 65 and above was 11.5% in 2019, marking it as an ageing population. This proportion is projected to increase to 16.9% in 2030, falling within the aged population definition. Similarly, the proportions of the population aged 65 and above in India and Indonesia, which were 6.4% and 6.1% in 2019, are expected to reach 8.6% and 9.2%, respectively, by 2030, falling within the ageing population definition. Among the developed countries, Japan, Italy and Portugal are classified as aged countries as they had the highest proportions of people over 65 years old in 2019, reaching 28.0%, 23.0% and 22.4%, respectively, marking them as aged countries.[3] By 2030, these countries are projected to have proportions of population over 65 of 30.9%, 27.9% and 27.0%, and are expected to fall within the super-aged and ultra-aged definitions by 2050. The expanding older populations globally profoundly impacts areas such as care for older individuals, social security systems, life expectancy and health span in both ageing and aged countries.[4] Therefore, it is crucial to understand the burden of population ageing.

The ageing population contributes to a substantial burden of mental disorders among older persons.[8] The impact of mental disorders on older people cannot be underestimated,[9] most notably dementia, but little is known about the incidence and disease burden associated with depressive and anxiety disorders and schizophrenia in ageing and aged countries. Comparing the incidence of mental illness and disease burden among older adults in ageing and aged countries could provide a better understanding of the mental health challenges faced by ageing countries when they transition to aged status. Therefore, this paper aimed to compare the burden of mental illness among the older populations in ageing and aged countries. Using the global disease burden database, we compared the incidence and burden of depression, anxiety and schizophrenia among the population aged 65 years and over in ageing and aged countries from 1990 to 2019.

METHODS

Data source

The Global Burden of Disease Study (GBD) 2019 estimated the incidence and disability-adjusted life years (DALYs) of 12 mental health conditions in 204 countries and territories from 1990 to 2019. This analysis specifically focused on the trend of depressive disorders, anxiety disorders and schizophrenia in incidence and DALYs among the older population in China, India, Indonesia, Japan, Italy and Portugal between 1990 and 2019 from the GBD 2019. We further explored variations within this population by sex and age group (65–69, 70–74, 75–79, 80–84, 85–89, 90–94 and ≥95) (figure 1).

Data on the incidence and DALYs of depressive disorders, anxiety disorders and schizophrenia in the specified countries were extracted from an online tool produced by the Institute for Health Metrics and Evaluation, which is publicly available called the Global Health Data Exchange query tool (http://ghdx.healthdata.org/gbd-results-tool).[10] The confirmed cases of depressive disorders, anxiety disorders and schizophrenia are mainly

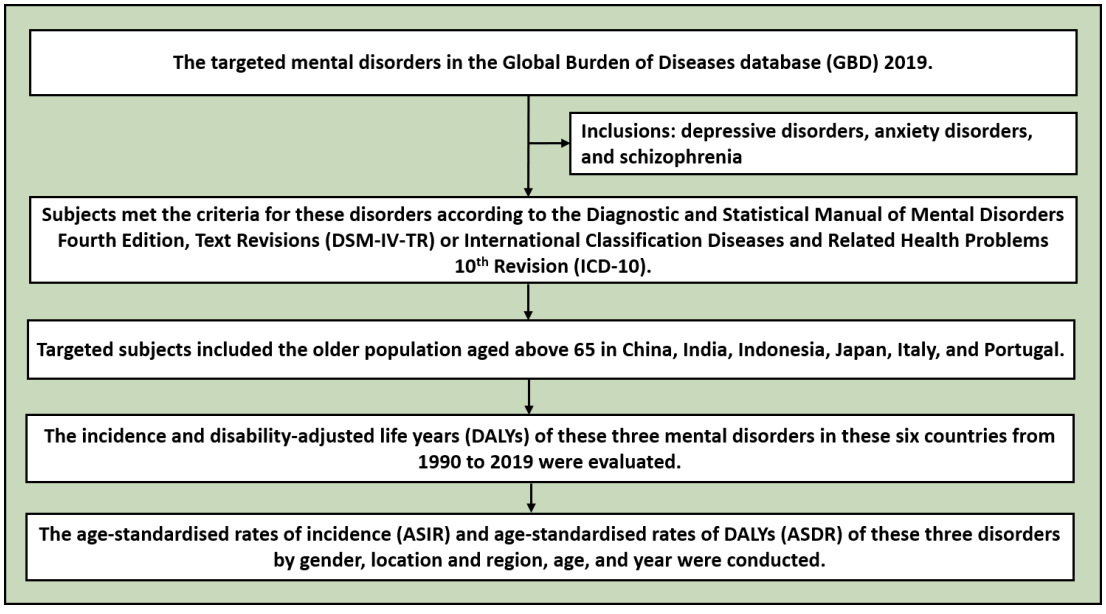

Figure 1 Study flowchart.

coded according to the Diagnostic and Statistical Manual of Mental Disorders (Fourth Edition, Text Revision) or the International Classification of Diseases and Related Health Problems (10th Revision).[2] The age-standardised incidence rates (ASIR) and age-standardised DALYs rates (ASDR) of these mental health conditions were also obtained by gender, location and region, age and year. Current ageing population data by country were obtained from the World Population Prospects 2019 revision (https://population.un.org/wpp/), which is an official UN population estimate and projection prepared by the Population Division of Economic and Social Affairs Department of the UN Secretariat.[3]

Statistical analysis

A descriptive analysis was performed among the number of cases per 100 000 population worldwide, and the DALYs of depressive disorders, anxiety disorders and schizophrenia in the six countries were stratified by seven age groups and gender to understand the burden of mental illness among older adults in ageing and aged countries. The results were reported with a 95% uncertainty interval (UI), calculated through 1000 draws from the posterior distribution of each quantity and using the 2.5th and 97.5th-ordered draws of the uncertainty distribution. The trends in disease burden between 1990 and 2019 were evaluated using the average estimated annual percentage change (EAPC).[11] We gathered the ASIR or ASDR for each year under study and fitted a regression line to the natural logarithm of the rates using the calendar year as a regressor ($\ln(\text{rate})=\alpha+\beta*\text{calendar year}$, with β representing the EAPC). To determine the EAPC and its 95% confidence interval (CI), we used the equation $\text{EAPC}=100*(e^{\beta}-1)$. For depressive disorders, anxiety disorders and schizophrenia, we followed the same steps using their specific ASIR and ASDR data. All statistical analyses were conducted using R software, and 0.05 was considered statistically significant (https://www.R-project. org).

RESULTS

The incidence of depressive disorders, anxiety disorders and schizophrenia among older people

We presented the key GBD findings for the incidence and ASIR of depressive disorders, anxiety disorders and schizophrenia over 70 years across China, India, Indonesia, Japan, Italy and Portugal from 1990 to 2019 in table 1 and figure 2A. In 2019, among the six countries, the highest incidence of depressive disorders was observed in China (5 797 556.9 (95% UI: 4 599 403.4 to 7 133 006.5)), followed by India (4 439 754.2 (95% UI: 3 543 615.3 to 5 509 288.7)) and Japan (927 271.3 (95% UI: 752 552.3 to 1 125 796.5)). On the other hand, Italy (638 686.4 (95% UI: 501 766.6 to 791 008.8)), Portugal (154 190.5 (95% UI: 114 827.8 to 200 218.3)) and Indonesia (211 427.4 (95% UI: 166 673.0 to 260 434.1)) had the lowest incidence of depressive disorders. The highest ASIR of depressive disorders in 2019 was in Portugal (9044.2 (95% UI: 6735.3 to 11 744.0) per 100 000), India (7855.6 (95% UI: 6270.0 to 9748.0) per 100 000) and Italy (6206.0 (95% UI: 4875.6 to 7686.1) per 100 000), while the lowest ASIR was in China (5369.9 (95% UI: 4260.1 to 6606.8) per 100 000), Japan (3363.6 (95% UI: 2729.8 to 4083.8) per 100 000) and Indonesia (2353.9 (95% UI: 1855.6 to 2944.5) per 100 000). From 1990 to 2019, the ASIR of depressive disorders increased in China, Japan and India, with EAPCs of 0.79 (95% CI: 0.62 to 0.97), 0.23 (95% CI: 0.10 to 0.36) and 0.18 (95% CI: 0.10 to 0.27), respectively, whereas ASIR decreased in Portugal, Italy and Indonesia with EAPCs of −0.53 (95% CI: −0.75 to −0.31), −0.32 (95% CI: −0.44 to −0.20) and −0.10 (95% CI: −0.16 to −0.04), respectively.

Among the six countries, the highest incidence of anxiety disorders in 2019 was reported in China (330 256.1 (95% UI: 246 448.9 to 445 987.4)), followed by India (145 595.2 (95% UI: 108 554.7 to 195 665.0)) and Japan (51 498.2 (95% UI: 37 625.7 to 70 487.3)), compared with the lower incidence reported in Indonesia (27 228.4 (95% UI: 20 224.3 to 36 981.6)), Italy (26 891.2 (95% UI: 19 729.4 to 36 619.8)) and Portugal (4752.4 (95% UI: 3390.7 to 6568.7)). Additionally, the greatest ASIR of anxiety disorders was reported in China (305.9 (95% UI: 228.3 to 413.1) per 100 000), Indonesia (303.1 (95% UI: 225.2 to 411.7) per 100 000) and Portugal (278.8 (95% UI: 198.9 to 385.3) per 100 000), followed by Italy (261.3 (95% UI: 191.7 to 355.8) per 100 000), India (257.6 (95% UI: 192.1 to 346.2) per 100 000) and Japan (186.8 (95% UI: 136.5 to 255.7) per 100 000). During the past three decades, the ASIR of anxiety disorders declined in all six countries except for Indonesia, with an EAPC of 0.02 (95% CI: 0.00 to 0.03).

In 2019, the highest incidence of schizophrenia was reported in China (1 067.7 (95% UI: 556.2 to 1775.9)), India (322.9 (95% UI: 151.9 to 588.3)) and Japan (126.0 (95% UI: 61.0 to 223.2)), in contrast to the lower incidence in Indonesia (92.4 (95% UI: 48.0 to 156.0)), Italy (69.9 (95% UI: 35.5 to 119.5)) and Portugal (9.5 (95% UI: 4.5 to 16.8)). Moreover, the greatest ASIR of schizophrenia in 2019 was reported in China (1.0 (95% UI: 0.5 to 1.6) per 100 000), Indonesia (1.0 (95% UI: 0.5 to 1.7) per 100 000) and Italy (0.7 (95% UI: 0.4 to 1.2) per 100 000), while the lower ASIR was in India (0.6 (95% UI: 0.3 to 1.0) per 100 000), Portugal (0.6 (95% UI: 0.3 to 1.0) per 100 000) and Japan (0.5 (95% UI: 0.2 to 0.8) per 100 000). Notably, all these countries showed a significant decline in the ASIR of schizophrenia from 1990 to 2019, with the EAPCs of China, Portugal, Italy, India, Japan and Indonesia being −1.41, −0.93, −0.74, −0.63, −0.58 and −0.57, respectively.

The DALYs for depressive disorders, anxiety disorders and schizophrenia among older people

Table 2 and figure 2A present the number of DALYs and ASDR for depressive disorders, anxiety disorders and schizophrenia in people aged 70 years and above

Table 1 The incidence and ASIR of depressive disorders, anxiety disorders and schizophrenia in China, India, Indonesia, Japan, Italy and Portugal from 1990 to 2019

	Incidence				
	Numbers in 1990 (95% UI)	**ASIR in 1990 (95% UI)**	**Numbers in 2019 (95% UI)**	**ASIR in 2019 (95% UI)**	**EAPC (95% CI)**
Depressive disorders					
China	1 593 505.8 (1 262 158.4 to 1 979 251.6)	4165.1 (3299.0 to 5173.4)	5 797 556.9 (4 599 403.4 to 7 133 006.5)	5369.9 (4260.1 to 6606.8)	0.79 (0.62 to 0.97)
India	1 235 096.0 (977 454.9 to 1 543 765.8)	7554.1 (5978.3 to 9442.0)	4 439 754.2 (3 543 615.3 to 5 509 288.7)	7855.6 (6270.0 to 9748.0)	0.18 (0.10 to 0.27)
Indonesia	90 794.1 (71 804.1 to 112 240.2)	2381.9 (883.7 to 2944.5)	211 427.4 (166 673.0 to 260 434.1)	2353.9 (1855.6 to 2944.5)	−0.10 (−0.16 to −0.04)
Japan	337 352.9 (271 711.1 to 410 211.1)	3412.7 (2748.6 to 4149.7)	927 271.3 (752 552.3 to 1 125 796.5)	3363.6 (2729.8 to 4083.8)	0.23 (0.10 to 0.36)
Italy	386 274.9 (298 280.1 to 485 063.1)	6973.7 (5385.1 to 8757.2)	638 686.4 (501 766.6 to 791 008.8)	6206.0 (4875.6 to 7686.1)	−0.32 (−0.44 to −0.20)
Portugal	83 862.4 (62 570.1 to 109 787.3)	9719.3 (7251.6 to 12 724.0)	154 190.5 (114 827.8 to 200 218.3)	9044.2 (6735.3 to 11 744.0)	−0.53 (−0.75 to −0.31)
Anxiety disorders					
China	125 350.5 (93 565.1 to 168 303.2)	327.6 (244.6 to 439.9)	330 256.1 (246 448.9 to 445 987.4)	305.9 (228.3 to 413.1)	−0.29 (−0.37 to −0.33)
India	43 984.2 (32 764.1 to 58 927.5)	269.0 (200.4 to 360.4)	145 595.2 (108 554.7 to 195 665.0)	257.6 (192.1 to 346.2)	−0.13 (−0.17 to −0.09)
Indonesia	11 248.6 (8359.0 to 15 206.3)	295.1 (219.3 to 398.9)	27 228.4 (20 224.3 to 36 981.6)	303.1 (225.2 to 411.7)	0.02 (0.00 to 0.03)
Japan	19 970.5 (14 708.1 to 27 072.4)	202.0 (148.8 to 273.9)	51 498.2 (37 625.7 to 70 487.3)	186.8 (136.5 to 255.7)	−0.29 (−0.32 to −0.26)
Italy	15 347.8 (11 171.0 to 20 851.4)	277.1 (201.7 to 376.4)	26 891.2 (19 729.4 to 36 619.8)	261.3 (191.7 to 355.8)	−0.18 (−0.23 to −0.14)
Portugal	2662.9 (1911.9 to 3637.9)	308.6 (221.6 to 421.6)	4752.4 (3390.7 to 6568.7)	278.8 (198.9 to 385.3)	−0.35 (−0.38 to −0.33)
Schizophrenia					
China	529.7 (291.4 to 859.4)	1.4 (0.8 to 2.2)	1067.7 (556.2 to 1775.9)	1.0 (0.5 to 1.6)	−1.41 (−1.52 to −1.30)
India	108.1 (50.8 to 196.6)	0.7 (0.3 to 1.2)	322.9 (151.9 to 588.3)	0.6 (0.3 to 1.0)	−0.63 (−0.75 to −0.52)
Indonesia	44.7 (23.8 to 75.4)	1.1 (0.6 to 2.0)	92.4 (48.0 to 156.0)	1.0 (0.5 to 1.7)	−0.57 (−0.64 to −0.51)
Japan	50.9 (24.4 to 90.3)	0.5 (0.2 to 0.9)	126.0 (61.0 to 223.2)	0.5 (0.2 to 0.8)	−0.58 (−0.65 to −051)
Italy	41.5 (21.0 to 69.8)	0.7 (0.4 to 1.3)	69.9 (35.5 to 119.5)	0.7 (0.4 to 1.2)	−0.74 (−0.92 to −0.56)
Portugal	5.9 (2.8 to 10.5)	0.7 (0.3 to 1.2)	9.5 (4.5 to 16.8)	0.6 (0.3 to 1.0)	−0.93 (−1.04 to −0.83)

ASIR, age-standardised incidence rate; CI, confidence interval; EAPC, estimated annual percentage change; UI, uncertainty interval.

Table 2 The DALYs and ASDR of depressive disorders, anxiety disorders and schizophrenia in China, India, Indonesia, Japan, Italy and Portugal from 1990 to 2019

	DALYs				
	Numbers in 1990 (95% UI)	**ASDR in 1990 (95% UI)**	**Numbers in 2019 (95% UI)**	**ASDR in 2019 (95% UI)**	**EAPC (95% CI)**
Depressive disorders					
China	269 902.0 (367 416.5 to 184 759.2)	705.5 (483.0 to 960.4)	924 798.4 (636 393.2 to 1 253 973.7)	856.9 (590.5 to 1159.2)	0.58 (0.46 to 0.70)
India	171 944.7 (118 805.4 to 234 995.1)	1051.6 (726.7 to 1437.3)	616 292.3 (423 994.2 to 843 173.6)	1090.5 (750.2 to 1491.9)	0.24 (0.16 to 0.32)
Indonesia	17 233.3 (11 830.8 to 23 627.9)	452.1 (310.4 to 619.9)	40 616.0 (27 605.3 to 55 619.3)	452.2 (307.3 to 619.2)	−0.04 (−0.07 to 0.00)
Japan	48 451.4 (33 182.4 to 66 467.1)	490.1 (307.3 to 619.2)	133 813.0 (91 815.5 to 182 199.6)	485.4 (333.1 to 661.0)	0.21 (0.11 to 0.31)
Italy	54 054.9 (36 483.6 to 73 888.2)	975.9 (658.7 to 1334.0)	90 466.5 (61 200.9 to 123 356.0)	879.0 (594.7 to 1198.7)	−0.29 (−0.40 to −0.18)
Portugal	11 756.5 (7645.8 to 17 120.3)	1362.5 (886.1 to 1984.2)	21 555.7 (14 240.5 to 31 630.3)	1264.4 (835.3 to 1855.3)	−0.53 (−0.75 to −0.30)
Anxiety disorders					
China	158 851.2 (223 975.6 to 107 065.8)	415.2 (279.9 to 585.4)	401 750.5 (273 367.8 to 557 311.5)	372.1 (253.2 to 516.2)	−0.62 (−0.79 to −0.45)
India	48 012.3 (32 241.1 to 67 158.9)	293.7 (197.2 to 410.8)	170 330.0 (117 048.8 to 236 314.2)	301.4 (207.1 to 418.1)	0.13 (0.09 to 0.18)
Indonesia	13 252.6 (9040.3 to 18 331.6)	347.7 (237.2 to 480.9)	33 414.5 (22 893.2 to 46 859.0)	372.0 (254.9 to 521.7)	0.23 (0.21 to 0.26)
Japan	20 916.0 (14 152.9 to 29 085.8)	211.6 (143.2 to 294.2)	54 882.0 (37 322.9 to 76 571.7)	199.1 (135.4 to 277.8)	−0.17 (−0.25 to −0.09)
Italy	27 982.9 (19 090.6 to 39 199.6)	505.2 (344.7 to 707.7)	49 452.5 (33 740.1 to 69 250.9)	480.5 (327.8 to 672.9)	0.04 (−0.07 to 0.16)
Portugal	6143.6 (3929.5 to 9494.8)	712.0 (455.4 to 1100.4)	12 182.6 (7750.8 to 18 596.9)	714.6 (454.6 to 1090.8)	−0.01 (−0.05 to 0.02)
Schizophrenia					
China	49 695.0 (36 119.9 to 62 699.3)	129.9 (94.4 to 163.9)	140 364.4 (102 032.1 to 178 538.9)	130.0 (94.5 to 165.4)	−0.07 (−0.1 to −0.04)
India	18 104.0 (13 184.3 to 23 095.8)	110.7 (80.6 to 141.3)	68 569.2 (49 654.4 to 87 084.9)	121.3 (87.9 to 154.1)	0.33 (0.30 to 0.35)
Indonesia	4095.2 (2967.9 to 5252.7)	107.4 (77.9 to 137.8)	10 470.4 (7515.9 to 13 467.6)	116.6 (83.7 to 149.9)	0.18 (0.14 to 0.22)
Japan	10 501.6 (7449.2 to 13 520.4)	106.2 (75.4 to 136.8)	28 875.2 (20 461.0 to 37 484.8)	104.7 (74.2 to 136.0)	0.05 (−0.02 to 0.12)
Italy	7789.0 (5572.9 to 9972.8)	140.6 (100.6 to 180.0)	13 362.4 (9560.2 to 17 164.7)	129.8 (92.9 to 166.8)	−0.35 (−0.41 to −0.29)
Portugal	1103.9 (739.4 to 1531.9)	127.9 (85.7 to 177.5)	2017.8 (1346.3 to 2775.2)	118.4 (79.0 to 162.8)	−0.30 (−0.34 to −0.26)

ASDR, age-standardised DALY rates; CI, confidence interval; DALYs, disability-adjusted life years; EAPC, estimated annual percentage change; UI, uncertainty interval.

in China, India, Indonesia, Japan, Italy and Portugal between 1990 and 2019. In 2019, the number of DALYs for depressive disorders in China (924 798.4 (95% UI: 636 393.2 to 1 253 973.7)), India (616 292.3 (95% UI: 423 994.2 to 843 173.6)) and Japan (133 813.0 (95% UI: 91 815.5 to 182 199.6)) was higher than Italy (90 466.5 (95% UI: 61 200.9 to 123 356.0)), Indonesia (40 616.0 (95% UI: 27 605.3 to 55 619.3)) and Portugal (21 555.7 (95% UI: 14 240.5 to 31 630.3)). In 2019, Portugal, India and Italy accounted for the highest ASDR for depressive disorders with 1264.4 (95% UI: 835.3 to 1855.3), 1090.5 (95% UI: 750.2 to 1491.9) and 879.0 (95% UI: 594.7 to 1198.7) per 100 000, respectively. In contrast, China, Japan and Indonesia had lower ASDRs for depressive disorders of 856.9 (95% UI: 590.5 to 1159.2), 485.4 (95% UI: 333.1 to 661.0) and 452.2 (95% UI: 307.3 to 619.2) per 100 000, respectively. Moreover, the ASDR for depressive disorders in China, India and Japan increased with EAPCs of 0.58, 0.24 and 0.21, respectively, while in Portugal, Italy and Indonesia, it decreased with EAPCs of −0.53, −0.29 and −0.04, respectively.

For anxiety disorders in 2019, the higher DALYs number was in China (401 750.5 (95% UI: 273 367.8 to 557 311.5)), India (170 330.0 (95% UI: 117 048.8 to 236 314.2)) and Japan (54 882.0 (95% UI: 37 322.9 to 76 571.7)), whereas the lower DALYs number was in Italy (49 452.5 (95% UI: 33 740.1 to 69 250.9)), Indonesia (33 414.5 (95% UI: 22 893.2 to 46 859.0)) and Portugal (12 182.6 (95% UI: 7750.8 to 18 596.9)). Meanwhile, the ASDR of anxiety disorders in 2019 was higher in Portugal (714.6 (95% UI: 454.6 to 1090.8) per 100 000), Italy (480.5 (95% UI: 327.8 to 672.9) per 100 000) and China (372.1 (95% UI: 253.2 to 516.2) per 100 000), while the ASDR of anxiety disorders in 2019 was lower in Indonesia (372.0 (95% UI: 254.9 to 521.7) per 100 000), India (301.4 (95% UI: 207.1 to 418.1) per 100 000) and Japan (199.1 (95% UI: 135.4 to 277.8) per 100 000). The ASDR of anxiety disorders increased for nearly 30 years in Indonesia, India and Italy, with EAPCs of 0.23, 0.13 and 0.04, respectively. Conversely, the ASDR of anxiety disorders declined in China, Japan and Portugal, with EAPCs of −0.62, −0.17 and −0.01, respectively.

As for schizophrenia in 2019, the countries with the highest number of DALYs were China (140 364.4 (95% UI: 102 032.1 to 178 538.9)), India (68 569.2 (95% UI: 49 654.4 to 87 084.9)) and Japan (28 875.2 (95% UI: 20 461.0 to 37 484.8)). In contrast, the lower number of DALYs was in Italy (13 362.4 (95% UI: 9560.2 to 17 164.7)), Indonesia (10 470.4 (95% UI: 7515.9 to 13 467.6)) and Portugal (2017.8 (95% UI: 1346.3 to 2775.2)). Overall, the ASDR of schizophrenia varied by country, being highest in 2019 in China (130.0 (95% UI: 94.5 to 165.4) per 100 000), followed by Italy (129.8 (95% UI: 92.9 to 166.8) per 100 000) and India (121.3 (95% UI: 87.9 to 154.1) per 100 000), and lower in Portugal (118.4 (95% UI: 79.0 to 162.8) per 100 000), Indonesia (116.6 (95% UI: 83.7 to 149.9) per 100 000) and Japan (104.7 (95% UI: 74.2 to 136.0) per 100 000). The ASDR for schizophrenia showed an increasing trend over the past 30 years in India, Indonesia and Japan, with EAPCs of 0.33, 0.18 and 0.05, respectively. An opposite trend was observed in Italy, Portugal and China, with EAPCs of −0.35, −0.30 and −0.07, respectively.

Gender differences in the incidence rate of depressive disorders, anxiety disorders and schizophrenia

Significant differences were observed in the ASIR of depressive disorders, anxiety disorders and schizophrenia between males and females when calculated using the risk ratio (RR) (figure 2B). In 2019, the ASIR of depressive disorders was higher in females than males in all six countries, with RRs in China, India, Indonesia, Japan, Italy and Portugal of 1.61, 1.29, 1.35, 1.75, 1.75 and 1.91, respectively. Conversely, for anxiety disorders, males had a higher ASIR than females, with RRs in China, India, Indonesia, Japan, Italy and Portugal of 0.91, 0.83, 0.97, 0.92, 0.81 and 0.73, respectively. Similar patterns were observed for schizophrenia, where males had a higher ASIR than females, with RRs in China, India, Indonesia, Japan, Italy and Portugal of 0.64, 0.77, 0.64, 0.81, 0.84 and 0.86, respectively (online supplemental table 1). The differences by sex and country in the incidence numbers of these three mental disorders among older adults are shown in online supplemental table 2.

We also observed sex disparities in the ASDR of all three mental disorders in all six countries (figure 2B). Consistent with the results of the ASIR results of depressive disorders in 2019, the ASDR of depressive disorders in females was higher than that in males in all six countries, with female to male ratios in China, India, Indonesia, Japan, Italy and Portugal of 1.54, 1.26, 1.35, 1.62, 1.62 and 1.77, respectively. The ASIR of anxiety disorders in men in all six countries was higher than that in women in 2019. However, opposite sex patterns were observed in the ASDR of anxiety disorders, with female to male ratios of 1.47, 1.32, 1.71, 1.56, 1.97 and 1.67 in China, India, Indonesia, Japan, Italy and Portugal, respectively. In 2019, the burden in terms of ASIR of schizophrenia in men was higher than that in women in all six countries. In addition, considerable regional variation was observed by gender in the ASDR of schizophrenia: the ASDR for schizophrenia was higher in females in Japan, Italy and Portugal, with female to male ratios of 1.06, 1.14 and 1.16, respectively; an opposite trend was observed in China, India and Indonesia, with female to male ratios of 0.89, 0.85 and 0.89, respectively (online supplemental table 1). In terms of DALYs, females had higher DALYs for depressive and anxiety disorders than males, whereas males had a higher DALYs for schizophrenia (online supplemental table 2).

Age groups of depressive disorders, anxiety disorders and schizophrenia

In 2019, all six countries showed a higher proportion of patients aged 65–69 years in terms of incidence of depressive disorders, with ageing countries such as Indonesia

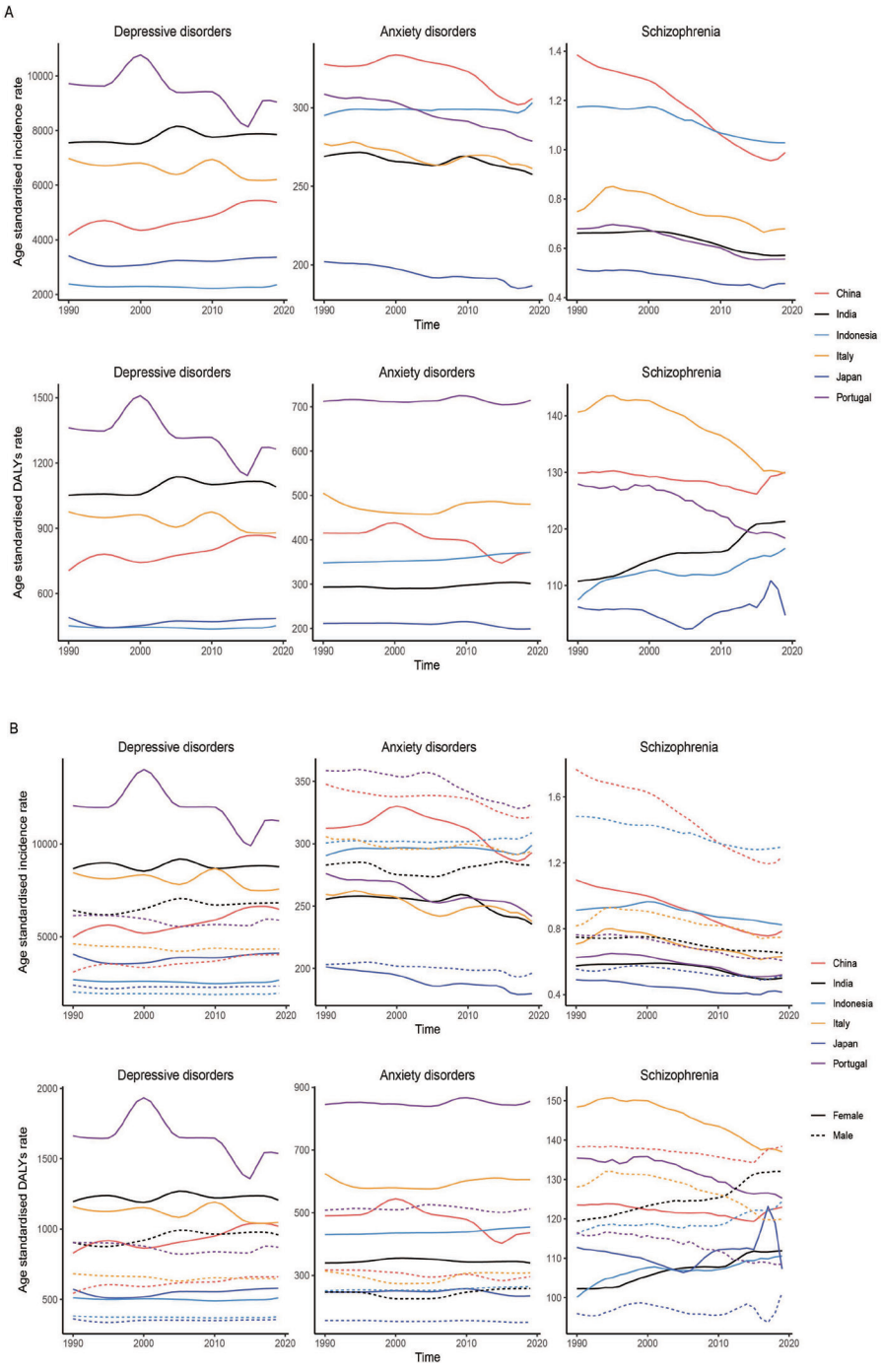

Figure 2 Trends for ASIR and ASDR of depressive disorders, anxiety disorders and schizophrenia in China, India, Indonesia, Japan, Italy and Portugal from 1990 to 2019 among both sexes (A) and between males and females (B). ASIR, age-standardised incidence rates; ASDR, age-standardised DALY rates; DALYs, disability-adjusted life years.

(45.8%), China (40.0%) and India (39.2%) having the highest proportions. Among aged countries, the highest proportions for the incidence of depressive disorders were in Portugal (28.6%), followed by Italy (26.6%) and Japan (26.0%). The DALYs for depressive disorders also had the highest proportion in the 65–69 years age group across all countries, with Indonesia (48.6%) leading among ageing countries and Portugal (29.8%) leading among aged countries (figure 3). India had the highest incidence of depressive disorders among people aged 65–79, and Portugal had the highest incidence of depressive disorders among people aged over 90 years, as shown in online supplemental figure 1.

For anxiety disorders, patients aged 65–69 years accounted for the highest proportion of incidence and DALYs. Indonesia accounted for the highest proportion in ageing countries, with 53.7% of incidence and 48.1% of DALYs, while Portugal accounted for the highest proportion in aged countries, with 44.2% of incidence and 33.3% of DALYs. Notably, Portugal accounted for the largest

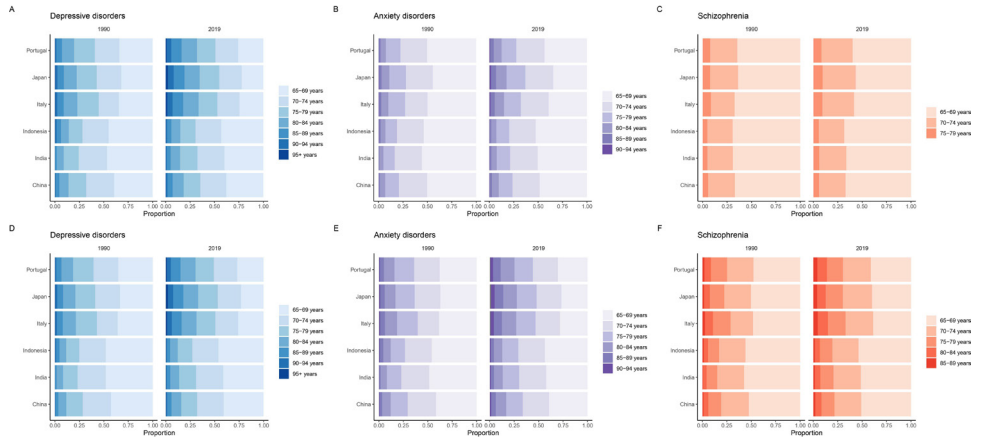

Figure 3 The composition of incidence (A–C) and DALYs (D–F) by age for depressive disorders, anxiety disorders and schizophrenia in China, India, Indonesia, Japan, Italy and Portugal during 1990–2019. DALYs, disability-adjusted life years.

proportion of the incidence burden for anxiety disorders among individuals under 80, while China topped the list among those above 80 years old (online supplemental figure 1). Portugal accounted for the largest proportion of the burden of anxiety disorders across all age groups, whereas Japan had the lowest incidence burden of anxiety disorders (online supplemental figure 2).

For schizophrenia, the largest proportion of incidence and DALYs occurred at ages 65–69, with 69.8% of incidence and 56.6% of DALYs in Indonesia (highest in ageing countries), and 60.8% of incidence and 44.0% of DALYs in Portugal (highest in aged countries).

DISCUSSION

Main findings

Depressive disorders, anxiety disorders and schizophrenia are major public health concerns and contribute substantially to the global burden of disease.[2] Compared with younger adults, older adults with common mental disorders have more physical illnesses, cognitive dysfunction, a less favourable prognosis and increased mortality.[7 12 13] Using data from the GBD 2019, we systemically described the incidence and DALYs of depressive disorders, anxiety disorders and schizophrenia among people aged 65 years and older in China, India, Indonesia, Japan, Italy and Portugal from 1990 to 2019. This analysis allowed comparisons of the health loss attributable to these mental disorders over time across age groups, genders and countries. It yielded four key findings: (1) A considerable decrease in ASIR for depressive disorders in the older population was observed in aged countries, while an increase was observed in ageing countries between 1990 and 2019. Conversely, both anxiety disorders and schizophrenia in the older adults had declining ASIR trends in ageing and aged countries. (2) A substantial upward trend of ASDR for depressive disorders, anxiety disorders and schizophrenia in older populations was noted in ageing countries, while a downward trend was observed in aged countries from 1990 to 2019. (3) In 2019, the ASIR and ASDR for depressive disorders were more pronounced in older females, while the ASIR for anxiety disorders was higher in older males. This pattern was reversed for ASDR in anxiety disorders. Additionally, variations were evident in ASIR and ASDR for schizophrenia across countries. (4) People aged 65–70 years experienced a higher burden of depressive disorders, anxiety disorders and schizophrenia than other age groups among older adults over the past 30 years. This trend was particularly pronounced in ageing countries.

The incidence of depressive disorders, anxiety disorders and schizophrenia among people aged 65 years and older in China, India, Indonesia, Japan, Italy and Portugal increased continuously from 1990 to 2019, aligning with research results from the global burden of incidence for these conditions over the past 30 years.[14–16] Notably, the highest incidence of all three conditions in older people among these six countries was observed in China, followed by India and Japan. China and India stand as the most populous nations globally, and Japan has the highest percentage of aged population in this century.[4] Population ageing is occurring throughout the world, with a significant rise in the proportion of people aged 65 years and older in both ageing and aged countries.[3] However, the ASIR of depressive disorders, anxiety disorders and schizophrenia in the older population displayed considerable variations across ageing and aged countries. In ageing countries, the ASIR for depressive disorders among older adults showed an upward trend from 1990 to 2019, while in aged countries a downward trend was observed, except for Indonesia and Japan. We observed a downward trend of the ASIR for depressive disorders in aged countries while an upward trend in ageing countries among the older population. Interestingly, this is not the case in a study focusing on the overall population. A previous study found a downward trend in the ASIR for depressive disorders at the national level in both ageing and aged countries from 1990 to 2017, with EAPCs of −0.59 in China, −0.74 in India, −0.13 in Indonesia, −0.35 in Italy and −0.27 in Portugal, with the exception of Japan (EAPC 0.42).[14] These findings may be attributed to the

different age groups of the participants, as our study focused solely on the older population, whereas the other study focused on all age groups. Factors such as rapid ageing in certain countries and potential higher risk of depression among lower-income populations might contribute to the observed increase in ASIR in ageing countries.[17] Therefore, our results support the necessity to develop health policies and implement medication and psychological interventions for depression tailored to different countries.

During the past three decades, the ASIR for anxiety disorders among the older population aged 65 and over has declined in all countries analysed except for Indonesia. This contrasts with global trends reported in a previous study, which indicated a slight increase in the ASIR for anxiety disorders globally from 1990 to 2019 for all age groups.[15] This discrepancy highlighted the importance of more standardised approaches in sample size and instrument selection across age-based studies. To our knowledge, this is the first study to demonstrate the downward trend of ASIR for anxiety disorders among people aged 65 years and over from 1990 to 2019. Indonesia's divergence from other ageing countries in terms of depression and anxiety trends may be attributed to its lower degree of ageing and a less developed healthcare system.[3] Consistent with previous findings of a slight decline in global ASIR for schizophrenia for all age groups from 1990 to 2017,[16] both ageing and aged countries showed significant decreases in the ASIR of schizophrenia among the older population from 1990 to 2019.

The trend of DALYs for depressive disorders, anxiety disorders and schizophrenia among older adults in these six countries was in accordance with the global trend for all age groups, suggesting an increase in disease burden among mental illnesses from 1990 to 2019.[2] Consistent with the incidence, China reported the highest DALYs for depressive disorders, anxiety disorders and schizophrenia in the older population, followed by India and Japan. However, the ASDR of these mental disorders in the older age group exhibited variations between ageing and aged countries. In concordance with the ASIR of depressive disorders in older adults, the ASDR for depression decreased in aged countries and increased in ageing countries from 1990 to 2019, with the exception of Indonesia and Japan. This discrepancy is potentially due to Indonesia's lower degree of ageing and Japan's higher degree of ageing in this research.[3] The predicted burden associated with depressive disorders among older persons in China exhibited an upward trajectory, contrasting with the reported decrease in ASDR of depressive disorders in China and India between 1990 and 2017 and the reduction in ASDR of depressive disorders in Japan from 1990 to 2015 across all age groups.[18–20] For anxiety disorders and schizophrenia in the older population, the ASDR increased in ageing countries and decreased in aged countries, with China being an exception. The observed downward trend of ASDR of anxiety disorders and schizophrenia in older adults in China is primarily attributed to a decline in the ASIR of these disorders from 1990 to 2019. However, despite this overall decline, the ASIR and ASDR for anxiety and schizophrenia experienced a notable surge in the last 3 years, contributing to a persistent increase in the absolute burden. This nuanced trend prompts the anticipation that the predicted burden of these mental disorders among the older people in China will continue to rise after 2019. This observation may be partly attributable to the exacerbated ageing demographics and heightened incidence rates amidst the global population in the backdrop of the coronavirus disease 2019 pandemic.[21]

An upward trend in ASDR of anxiety disorders in older adults was observed in Indonesia in accordance with the increases in ASIR of anxiety disorders. However, an increased ASDR and a decreased ASIR of anxiety disorders among the older population were observed in India. This phenomenon may be partly attributed to the second largest proportion of the populations and the poor healthcare system in India as the population ages.[6] A previous study reported stable ASDR trends for anxiety disorders worldwide with an EAPC of −0.001 and for schizophrenia with an EAPC of −0.005 from 1990 to 2017 across all age groups.[15 16] Some studies suggested a general increasing trend of the ASDR of schizophrenia with an EAPC of 0.038 in China over the last three decades.[22] This inconsistency observed in reported ASDRs of anxiety disorders and schizophrenia emphasises the unique trends among older adults in ageing and aged countries. Future efforts are needed to better understand the persistence of depressive disorders, anxiety disorders and schizophrenia in the older population.

Significant disparities were observed in the burden of these mental conditions among people aged 65 years and older between males and females in ageing and aged countries. First, we identified a higher ASIR and ASDR of depressive disorders among the older population in these six countries in females than in males in 2019. This sex disparity is consistent with previous reports indicating a higher risk and greater burden of depressive disorders in females than in males.[2] This study is the first to demonstrate that this trend is more pronounced in aged countries. Second, while global evidence suggests higher ASIR of anxiety disorders in females, our study reveals an opposite trend among individuals aged 65 years and older in all six countries analysed.[23 24] Our results align with some previous studies on an older population (aged 75 years and older).[15] However, the opposite trend was observed in the ASDR of anxiety disorders, with older females experiencing a higher burden than males. Our research findings supported the previous studies that the burden of anxiety disorders was greater in females than males at the national level.[13 25] These findings highlighted the complexity of the relationship between anxiety disorders, gender and age. Third, the ASIR of schizophrenia was greater in older males than females in all six countries in 2019, consistent with emerging evidence indicating a higher incidence of schizophrenia in males worldwide.[26]

It was noteworthy that the ASDR of schizophrenia among older adults significantly varied by gender and country. In ageing countries, the ASDR for schizophrenia among the older population was higher in men than women, consistent with a recent global study on ASDR at the national level for all ages.[16] Conversely, in aged countries, the trend reversed, with the ASDR being higher in women than men. This difference may be associated with an increased risk of comorbid substance use disorder in females than in males in aged countries.[27]

In the age group analysis across six countries, the incidence and DALYs of depression, anxiety and schizophrenia were highest among people aged 65–70. Notably, when considering the absolute burden of these conditions in older age groups, Portugal and Indonesia accounted for a more substantial proportion of patients aged 65–70. This aligns with previous research indicating that Portugal had the highest ASIR and ASDR of anxiety disorders,[15] reflecting a consistent trend in overall mental disorders.[2] In addition, the incidence rate of depressive disorders and anxiety disorders was highest in the age range of 65–79 years, consistent with patterns observed in a previous study on the incidence rate of depressive and anxiety disorders among those aged 67–81 years.[28] Notably, to our best knowledge, this study is the first to find that Indonesia had the highest burden of incidence and DALYs for depressive disorders, anxiety disorders and schizophrenia among the older population in ageing countries, highlighting that Indonesia faced a severe burden of mental disorders in this context.

As the global population continues to age, depressive disorders, anxiety disorders and schizophrenia will continue to impose an increasing burden on the healthcare system.[29] Urgent actions are needed to address the widespread issues of stigma and discrimination against individuals with these mental disorders in the older population, as they have far-reaching consequences.[30] Future studies are warranted to provide insights to guide the development and implementation of specific policies for depression, anxiety and schizophrenia among the older population in more countries and regions.

Limitations

There are several limitations to our research. First, the subtypes of depressive disorders, such as major depressive disorders and dysthymia, were not further analysed. Second, the burden of depressive disorders, anxiety disorders and schizophrenia under the age of 65 was not investigated. Third, the burden of these three mental disorders was confined to six countries, and the risk factors in different countries and regions were not explored.

Implications

In summary, this study provides a systematic and comprehensive overview of the burden of depressive disorders, anxiety disorders and schizophrenia in terms of incidence and DALYs among people aged 65 years and older in ageing countries (China, India, Indonesia) and aged countries (Japan, Italy, Portugal) over the past three decades. Notably, our findings highlighted the country-specific variations in the ASIR and ASDR of these mental disorders among older populations. Moreover, we identified specific vulnerability patterns, with females exhibiting a higher risk of depressive disorders and males at a higher risk of anxiety disorders and schizophrenia. The age group of 65–70 years emerged as particularly susceptible to these mental disorders. These insights into age, sex and country-specific burdens could inform targeted interventions and policies. Finally, our results provide insight for other countries and regions facing ageing-related challenges to understand better the burden of depressive disorders, anxiety disorders and schizophrenia among older people within the global ageing context.

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