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Trends in disability adjusted life years of anxiety disorders from 1990 to 2019 in Indonesia: Evidence from joinpoint regression analysis

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Abstract

In 2019, anxiety disorders constituted a significant share of the disability adjusted life years (DALYs) lost as a result of mental disorders. This study sought to examine the gender and age-specific distribution pattern and the trends of DALYs in anxiety disorders. Using descriptive methods, the study examined the trends in the DALYs of anxiety disorders in Indonesia from 1990 to 2019. The initial step was to extract age-standardized DALYs rates (ASR) data from the Global Health Data Exchange (GHDx) covering the period from 1990 to 2019. Trend data analysis used the joinpoint regression analysis. The results indicate that DALYs rate due to anxiety were higher in women as compared to men. The highest anxiety rate in Indonesia in both 1990 and 2019 was between 25-49 years old. Anxiety rates are important to monitor for stakeholders, particularly for women and those in the reproductive age groups. (*Afr J Reprod Health* 2024; 28 [10s]: 191-198).

Keywords: Anxiety disorders, DALYs, joinpoint trends analysis

Résumé

En 2019, les troubles anxieux constituaient une part significative des années de vie ajustées en fonction de l'incapacité (DALYs) perdues en raison des troubles mentaux. Cette étude visait à examiner le modèle de distribution selon le sexe et l'âge ainsi que les tendances des DALYs liés aux troubles anxieux. En utilisant des méthodes descriptives, l'étude a analysé les tendances des DALYs des troubles anxieux en Indonésie de 1990 à 2019. La première étape a consisté à extraire les données des taux de DALYs standardisés par âge (ASR) à partir du Global Health Data Exchange (GHDx) couvrant la période de 1990 à 2019. L'analyse des données de tendance a été réalisée à l'aide de l'analyse de régression joinpoint. Les résultats indiquent que le taux de DALYs dus à l'anxiété était plus élevé chez les femmes par rapport aux hommes. Le taux d'anxiété le plus élevé en Indonésie en 1990 et 2019 était observé chez les personnes âgées de 25 à 49 ans. Les taux d'anxiété sont importants à surveiller pour les parties prenantes, en particulier pour les femmes et celles appartenant aux groupes d'âge reproductif. (*Afr J Reprod Health* 2024; 28 [10s]: 191-198).

Mots-clés: Troubles anxieux, DALYs, analyse des tendances joinpoint

Introduction

Anxiety disorders accounted for a large proportion of DALYs lost due to mental disorders globally in 2019 (22.9%)¹. Mental disorders were the 13th leading cause of disability-adjusted life years (DALYs) lost in 1990, and the seventh leading cause of DALYs lost in 2019. Mental disorders were the second leading cause of years lived with disability (YLD) worldwide in 1990 and 2019. At the level of disorders of the 25 main causes of YLD in 2019, anxiety disorders ranked eighth.

Mental health issues are also impacted by the COVID-19 pandemic. A rise in anxiety and

depression disorders has been linked to SARS-CoV-2 infection and decreased human mobility. It is projected that the COVID-19 pandemic has caused a 27.6% increase in cases of depression. Globally, the number of instances of anxiety disorders rose by 25.6%. In 2020, anxiety disorders contributed to 44.5 million DALYs lost². The aforementioned information and circumstances demonstrate that anxiety is a serious mental health issue that require immediate attention, particularly in Indonesia. Anxiety disorders have become much more prevalent on a national and international scale, which will lower public health standards. Anxiety disorders in particular, have significant negative

impacts on the quality of life for those who suffer from them³.

Anxiety disorders accounted for the majority of the worldwide health burden associated with mental diseases before 2020. Numerous factors that contribute to poor mental health have become worse as a result of the COVID-19 pandemic⁴. The 2019 Global Burden of Diseases, Injuries, and Risk Factors Study (GBD)⁴ lists twelve different categories for mental disorders: conduct disorders, attention deficit hyperactivity disorder, eating disorders, idiopathic, developmental intellectual disabilities, bipolar disorders, depressive disorders, anxiety disorders, bipolar disorders, schizophrenia, and autism spectrum disorders. According to this study, depression and anxiety disorders are the most incapacitating mental illnesses. In 2019, these two mental illnesses were listed as two of the top 25 global causes of burden⁴.

The circumstances that elicit fear, anxiety, avoidance behaviour, as well as the thoughts that go along with them, are what distinguish anxiety disorders from one another. As a result, anxiety disorders are frequently highly comorbid with one another, and this can be determined by closely examining the kinds of circumstances that a person fears or avoids as well as the ideas and beliefs that go along with them⁵. F40–42, F43.0, F43.1, F93.0–93.2, F93.8, and DSM–IV–TR: 300.0–300.3, 208.3, 309.21, 309.81 are ICD-10 codes for anxiety disorders⁶. These codes include panic disorder, agoraphobia, specific phobia, social phobia, obsessive–compulsive disorder, post-traumatic stress disorder, and generalised anxiety disorder⁶.

Joinpoint models, which connect many lines at "joinpoints" or inflection points can be used to study this challenge. Joinpoint is a statistical software used for trend analysis⁷. Starting with a minimum number of joinpoints (zero joinpoint being a straight line), the software fits the simplest joinpoint model that the data allows. It then determines whether more joinpoints are statistically significant and should be added to the model until it reaches the maximum number of joinpoints that the data permits. A minimum and maximum number of joinpoints can be entered by users to determine the statistical significance of the trend shift⁷.

The objective of this study was to analyse the distribution pattern of DALYs in Indonesia due to anxiety disorders based on gender and age groups using joint point analytical method. The study also

analyses trends in DALYs due to anxiety disorders from 1990 to 2019 in the country.

Methods

Study design

This study examines patterns in the DALYs rate for anxiety disorders in Indonesia from 1990 to 2019 using descriptive approaches. DALYs rate trends attributable to anxiety disorders were first examined by extracting data on age-standardized infection rates (ASR) from the Global Health Data Exchange (GHDx) for the years 1990 to 2019⁸. Trends in the rate of DALYs attributable to anxiety disorders were analysed using joinpoint regression analysis. This study offers suggestions for preventive measures after methodically analysing and interpreting patterns in the 30-year DALY rates in Indonesia related to anxiety disorders.

Study population

The information used in this study was gathered from the Global Burden of Disease (GBD) results 2019⁸, which were calculated by locating a number of pertinent data sources, such as sickness notifications, health reports, and scholarly publications like Basic Health Research in Indonesia and the Indonesian Health Profile.

Data source

The Institute for Health Metrics and Evaluation's (IHME) 1990–2019 Global Burden of Disease Study provided secondary data from which variable data was derived⁸. Terms and conditions have been outlined and apply to public access⁹. The IHME also provides a dedicated page to access the data¹⁰.

Statistical analysis

A database was created by entering DALYs data from 1990 to 2019 related to anxiety disorders in Indonesia into Microsoft Excel 2019. To assess the absolute and relative changes in age-standardized prevalence rates (ASR) across the observation time, the difference between the starting and final ASRs for men and women was computed. Trends in DALYs rates were evaluated using Joinpoint software (Joinpoint Regression Programme, Version 5.0.2. May, 2023) from the Statistical

Research and Applications Branch of the National Cancer Institute¹¹. The programme determines whether more joinpoints are statistically significant and should be added to the model (up to the maximum number) after starting with a minimum number of joinpoints (for example, 0 joinpoints, which is a straight line). Users can use this to determine whether the observed trend changes are statistically significant¹². Merge points are found using the grid search method (GSM). Next, the best-fitting model is chosen using the Bayesian information criterion (BIC). The software computed annual percent change (APC) for each line segment and average annual percent change (AAPC) for all line segments with 95% confidence intervals, and significance testing was performed using the Monte Carlo permutation approach^{13,14}.

Ethical consideration

No ethical approval was required for this study. The dataset was obtained from the publicly available Global Burden of Disease (GBD) database. Human subjects were not directly involved, so ethical approval was not required.

Results

Table 1 shows that women experience anxiety disorders at a DALYs rate that is about twice that of men. The DALYs rate of anxiety in women was 408.5 per 100,000 in 1990, compared to 234.52 per 100,000 in males. In 2019, the figures for women and men respectively increased to 430.81 and 247.27 per 100,000. The rate of rise was higher for women as well (22.31 per 100,000). Men's AAPC, however, was greater, at 0.182 (95%CI: 0.180-0.185).

According to age, the highest anxiety rate in Indonesia in both 1990 and 2019 was between 25-49 years old with the highest rate among 30-34 years old (419.80 per 100,000 population) occurring in 1990. In 2019, it was highest among the 35-39 age group (440.84 per 100,000 population). After age 50, the rate of DALYs due to anxiety tends to decrease, with the lowest rate at age 70+ (347.67 per 100,000 population in 1990 and 372.02 per 100,000 population in 2019). The age group before the age of 25 also has a low rate, namely <5 years (7.24 per 100 000 in 1990 and 7.80 per 100 000 in 2019). The highest increase in the rate of anxiety was in the age

group 70 years and older (23.35 per 100,000) with an AAPC of 0.231 (95% CI: 0.228-0.234).

Table 2 presents the findings of the joinpoint regression modelling study, which indicate six trends for both men and women between 1990 and 2019. For the past 20 years, women's trends have consistently been rising. APC: 0.36 was the biggest growth from 2011 to 2017 (trend 5), and APC: 0.04 was the lowest increase from 1999 to 2006 (trend 4). Men similarly showed an increasing trend, except of trend 2 (1994–2003), which saw a decline (APC: -0.06). With an APC of 0.52, the biggest growth occurred in 2006-2009 (trend 4), the lowest increase occurred in 2014-2019 (trend 6), with an APC of 0.14.

The number of anxiety trends by age varies. The highest increase occurred in the 70+ age group in 2011-2014 (trend 3) APC: 0.58, age <5 years in 2006-2019 (trend 2) APC: 0.50, age 5-9 in 2010-2017 (trend 5) APC:0.49 and ages 10-14 in 2013-2017 (trend 5) APC:0.48. The highest decline was in those aged 20-24 years in 1995-2000 (trend 3) APC: -0.13 and aged 50-54 years in 1999-2005 (trend 2) APC: -0.12. Figure 1 shows a visualization that between men and women there has been an increasing trend since 1990-2019. A sloping or decreasing trend can be seen from 2000 to 2006, but it again increased from 2007 to 2019. The highest line of increase occurred from 2007–2013.

Figure 2 shows that all ages experience an increasing trend in DALYs due to anxiety disorders. The lowest values were at ages <5 years, 5-9 years, and 10-14 years. The graph shows that the highest increase is at age 70+ years. The 50-54-year age group also saw an increase after a slight decline. Most age groups have DALYs > 350 except those aged < 14 years.

Discussion

This study employs a Joinpoint regression model to analyse the time trend of changes in DALYs for anxiety disorders in Indonesia from 1990 to 2019, based on data on the DALYs rate attributable to anxiety disorders in Indonesia in GBD 2019. The article assesses the features of the 30-year increases in DALYs for anxiety disorders by age group, gender, and time. The results of this study indicate that when compared to men, women experience more anxiety. This is consistent with global data showing that anxiety causes greater DALYs for

Table 1: The age-standardized DALYs from anxiety disorders in 1990 and 2019, and its change from 1990-2019 in Indonesia

Characteristics		ASR (95% UI), 1990	ASR (95% UI), 2019	Change Value, 1990-2019	AAPC 1990-2019 (95% CI)
Total		322.86 (226.92-441.23)	338.9 (239.58-465.15)	16.04 (12.66-23.92)	0.180* (0.176-0.185)
Sex	Male	234.52 (163.71-320.85)	247.27 (174.32-339.70)	12.75 (10.61-18.85)	0.182* (0.180-0.185)
	Female	408.5 (286.31-554.95)	430.81 (303.02-593.74)	22.31 (16.71-38.79)	0.168* (0.164-0.171)
Age	<5	7.24 (4.09-11.48)	7.80 (4.64-12.18)	0.56 (0.55-0.70)	0.276* (0.259-0.292)
	5-9	105.28 (64.41-160.46)	112.48 (68.21-171.98)	7.20 (3.80-11.52)	0.231* (0.224-0.238)
	10-14	273.07 (169.98-409.52)	289.23 (181.18-426.89)	16.16 (11.20-17.37)	0.201* (0.195-0.206)
	15-19	368.27 (244.27-531.49)	386.48 (256.47-561.80)	18.21 (12.20-30.31)	0.166* (0.160-0.172)
	20-24	405.99 (257.01-611.75)	422.61 (266.84-629.31)	16.62 (9.83-17.56)	0.138* (0.135-0.142)
	25-29	419.05 (264.01-630.07)	435.2 (274.17-659.73)	16.15 (10.16-29.66)	0.132* (0.127-0.137)
	30-34	419.80 (273.31-599.72)	439.88 (286.39-636.55)	20.08 (13.08-36.83)	0.156* (0.149-0.162)
	35-39	418.14 (275.78-592.25)	440.84 (290.92-620.07)	22.70 (15.14-27.82)	0.183* (0.179-0.187)
	40-44	419.47 (271.04-601.57)	440.69 (282.64-640.38)	21.22 (11.60-38.81)	0.171* (0.167-0.175)
	45-49	419.42 (274.20-602.47)	437.66 (285.50-632.80)	18.24 (11.30-30.33)	0.148* (0.141-0.153)
	50-54	415.98 (283.84-575.37)	434.35 (294.13-616.13)	18.37 (10.29-40.76)	0.151* (0.145-0.155)
	55-59	410.72 (284.17-566.30)	429.4 (293.14-594.29)	18.68 (8.97-27.99)	0.154* (0.149-0.159)
	60-64	401.49 (264.82-571.09)	420.70 (276.42-601.49)	19.21 (11.60-30.40)	0.165* (0.159-0.170)
	65-69	385.81 (252.23-555.26)	405.53 (265.22-582.68)	19.72 (12.99-27.42)	0.174* (0.167-0.180)
	70+	347.67 (237.16-480.91)	372.02 (254.88-521.70)	23.35 (17.72-40.79)	0.231* (0.228-0.234)

women than for males¹⁵. These variations might be connected to the unique hormones that women have. For instance, some studies indicate that women are more prone to anxiety problems when going through different phases of the reproductive life cycle, including menstruation, adolescence, pregnancy, the postpartum period, and menopause^{16,17}. Poor mental health in pregnant women can be influenced by financial uncertainty, a lack of emotional support from partners and family, and other factors¹⁸. Gender differences may also result from women's increased susceptibility to traumatic and stressful life events. Numerous

studies have examined this theory and found variations in brain pathways that affect emotional reactivity¹⁹. Additionally, there is a significant correlation between anxiety and premenstrual syndrome in adolescents²⁰.

In Indonesia, the number of DALYs attributable to anxiety disorders has increased. Between 1990 and 2019, there was minimal variation in the prevalence, incidence, and disability-adjusted life years (DALYs) of anxiety disorders globally. The countries in Western Europe exhibit a higher pace of growth than the world average. Particularly in Brazil, prevalence rates

Table 2: Joinpoint analysis age-standardized DALYs rates from anxiety disorders in Indonesia by sex and age, 1990–2019

Characteristics	Trend 1		Trend 2		Trend 3		Trend 4		Trend 5		Trend 6		
	Years	APC											
Total	1990-1993	0.21*	1993-1998	0.08*	1998-2006	0.01	2006-2016	0.32*	2016-2019	0.19*	-	-	
Sex	Male	1990-1994	0.29*	1994-2003	-	2003-2006	0.11	2006-2009	0.52*	2009-2014	0.40*	2014-2019	0.14*
		Female	1990-1996	0.14*	1996-1999	0.19*	1999-2006	0.04*	2006-2011	0.21*	2011-2017	0.36*	2017-2019
Age	<5	1990-2006	0.10*	2006-2019	0.50*	-	-	-	-	-	-	-	-
	5-9	1990-1992	0.31*	1992-1999	0.13	1999-2005	0.05	2005-2010	0.29*	2010-2017	0.49*	2017-2019	0.02
	10-14	1990-1992	0.3*	1992-1999	0.10	1999-2005	-0.01	2005-2013	0.32*	2013-2017	0.48*	2017-2019	0.04
	15-19	1990-1994	0.26*	1994-2005	-	2005-2011	0.26*	2011-2017	0.36*	2017-2019	0.13*	-	-
	20-24	1990-1992	0.35*	1992-1995	0.13*	1995-2000	-	2000-2006	0.03	2006-2009	0.22	2009-2019	0.27*
	25-29	1990-1992	0.39*	1992-1995	0.13	1995-2001	-0.10	2001-2006	0.02	2006-2019	0.24*	-	-
	30-34	1990-1994	0.37*	1994-2000	0.01	2000-2005	-0.06	2005-2015	0.26*	2015-2019	0.18*	-	-
	35-39	1990-1994	0.33*	1994-2000	0.17*	2000-2006	-	2006-2014	0.29*	2014-2019	0.17*	-	-
	40-44	1990-1995	0.05*	1995-1999	0.32*	1999-2006	0.03*	2006-2014	0.31*	2014-2019	0.15*	-	-
	45-49	1990-1996	-0.01	1996-2001	0.12*	2001-2005	-0.02	2005-2011	0.39*	2011-2015	0.28*	2015-2019	0.09*
	50-54	1990-1999	0.08*	1999-2005	-	2005-2016	0.38*	2016-2019	0.08*	-	-	-	-
	55-59	1990-1993	0.00	1993-1999	0.13*	1999-2007	-	2007-2011	0.32*	2011-2017	0.40*	2017-2019	0.17*
	60-64	1990-2006	0.08*	2006-2012	0.15*	2012-2019	0.37*	-	-	-	-	-	-
65-69	1990-2006	0.11*	2006-2017	0.27*	2017-2019	0.11*	-	-	-	-	-	-	
70+	1990-2006	0.11*	2006-2011	0.35*	2011-2014	0.58*	2014-2019	0.27*	-	-	-	-	

have increased significantly, rising from 5,894 cases per 100,000 people in 1990 to 7,410 cases per 100,000 people in 2019. With the exception of Europe, all regions of the world are seeing an increase in the overall number of cases due to population growth and aging²¹.

The reproductive age is when worry is at its maximum. In line with earlier reports, our study show that anxiety is more prevalent in the 18–44 age group than other age groups²². The study's findings suggest that the increase in the DALYs in this group may be attributable to anxiety. Furthermore, those between the ages of 35 and 44 are in a crucial stage

of life when they must deal with increasing pressures from work and the economy, among other things, which makes them more susceptible to anxiety disorders. Long-term economic stress has been linked to increased symptoms of worry/anxiety and anxiety/panic, according to reports. This could help to explain why the 35–49-year-old age group has a greater incidence rate and rate of DALY anxiety disorders²³.

This study has several strengths. The use of data from GBD 2019 by IHME provides a strong foundation as it is comprehensive and reliable, covering a wide range of countries and regions in

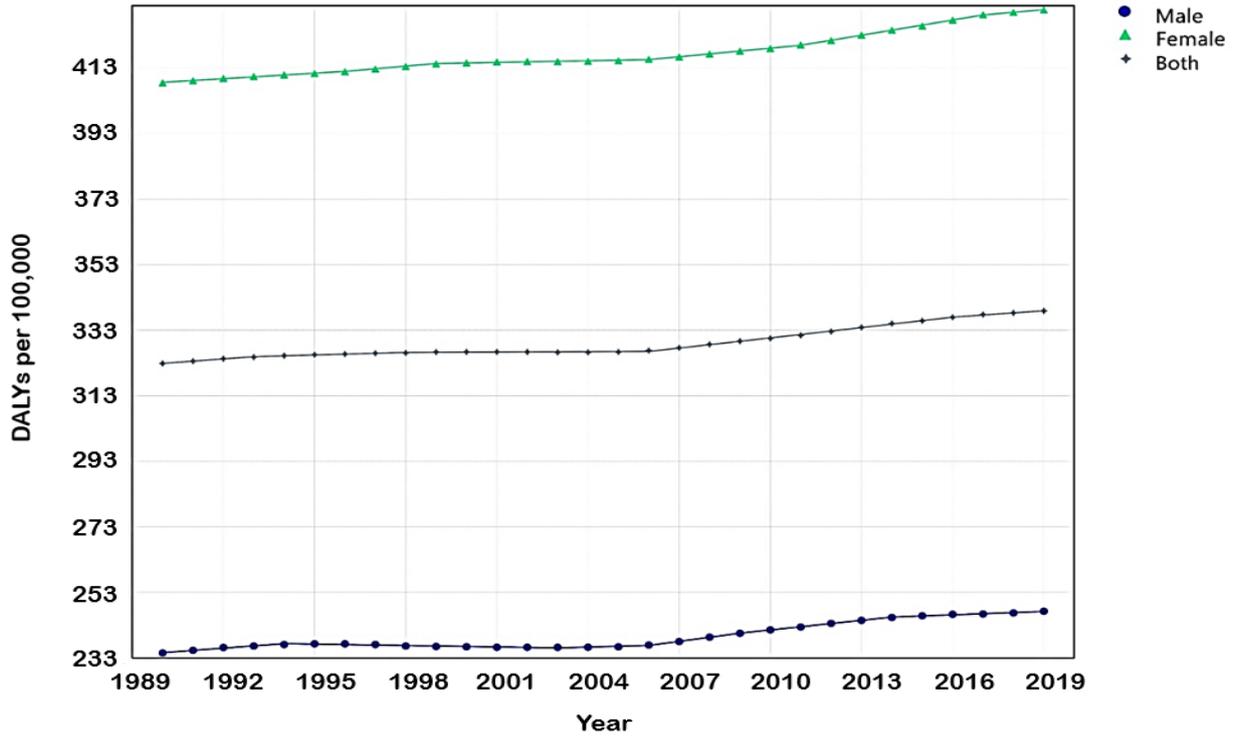


Figure 1: Trends in age-standardized DALYS rate per 100.000 of anxiety disorders between 1990 and 2019, by sex; ASR: age-standardized DALYS rate (per 100,000)

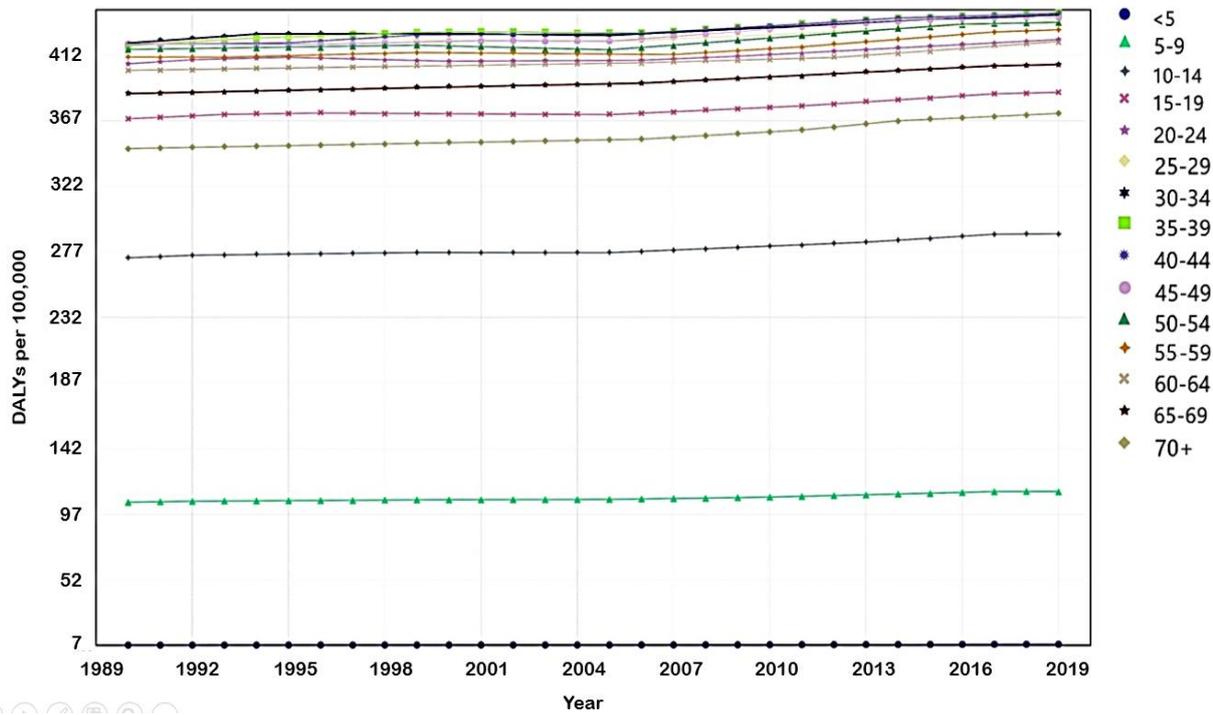


Figure 2: Trends in age-standardized DALYS rate per 100.000 of anxiety disorders between 1990 and 2019, by age; ASR: age-standardized DALYS rate (per 100,000)

detail. The long study period, from 1990 to 2019, allows researchers to identify long-term trends in disease burden, particularly DALYs due to anxiety disorders in Indonesia. In addition, the analysis using joinpoint regression provides an advantage in detecting significant changes in trends, which enriches the insights regarding important inflection points.

There are several limitations to this study. The reliance on secondary data from GBD 2019 may lead to reporting bias or data deficiency in some parts of Indonesia, especially in areas with limited health data. In some cases, data estimation was done through statistical modeling for data-deficient regions, which may affect the accuracy of the results. In addition, while joinpoint regression effectively detects trend changes, the results are highly dependent on the model's assumptions, so an inappropriate selection of change points may affect the interpretation.

Conclusion

This study demonstrates that, across all age groups and genders, the trend of DALYs attributable to anxiety disorders has increased from 1990 to 2019. The DALYs associated with anxiety disorders are higher in women than in males because of hormonal and psychological variables. DALYs from anxiety disorders are higher in reproductive age groups than in other groups. As a result, interested parties need to keep an eye on how this trend is developing. Preventive measures should be implemented as soon as possible for vulnerable populations, such as women and people in their prime working years.

Contribution of authors

Mohamad Anis Fahmi: conceptualized and designed the study, collected and analysed the data
Santi Martini: reviewed empirical studies
Arief Hargono: designed the methodology

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