ORIGINAL ARTICLE

DISTRIBUTION OF AUTISTIC CHILDREN IN PONTIANAK, WEST KALIMANTAN PROVINCE, INDONESIA

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ABSTRACT

The prevalence of autism spectrum disorder (ASD) data is still limited, especially in developing countries. Meanwhile, an increase in ASD children has occurred almost all over the world, including in Indonesia. The Ministry of Health of the Republic of Indonesia reported more than 5,500 cases of child development disorders – including autism disorders – that received services at primary health centres during 2020 – 2021. Data on the prevalence of autistic disorders have been estimated to increase by 500 per year. The Disability and Assessment Centre Service in Pontianak records an increase in children with autistic disorders every year. This study aims to map the spread of autism in Pontianak. This is an observational study to map the distribution of ASD children in Pontianak. The data sources are medical records from Pontianak Psychiatry Hospital and registration at Disability and Assessment Centre Services, recorded from 2015 to 2020. This study collected 147 cases of autism recorded at both service units. After screening for data duplication, 143 cases were used. Only 83 cases had a complete address that can determine coordinates. Using the determination of coordinates based on addresses obtained using GPS and spatial analysis using ArcGIS, the results showed that the distribution pattern of ASD children in Pontianak City was clustered. Most ASD children live in densely populated areas. Urban environments with high population density have problems that can affect the health of their residents. Further research is needed to determine the relationship between environmental factors and the incidence of autism in Pontianak.

***Keywords**: autism syndrome disorder; children; spatial distribution*

INTRODUCTION

The American Psychiatric Association (2013) defines autistic people as those who tend to have communication deficiencies, such as responding inappropriately in conversation, misreading non-verbal interactions or having difficulty building age-appropriate friendships. In addition, people with autism can rely too much on routine, be very sensitive to changes in their environment or focus too much on indecorous items[1]. Autism is generally diagnosed during childhood because children and infants are a high-risk group and are more susceptible to neurological disorders than adults[2].

Hodges, Fealko and Soares (2020) stated that autism spectrum disorder (ASD) is a neurobiological disorder in the developing brain that is influenced by genetic and environmental factors[3]. Researchers have not been able to determine the exact cause of this disorder until now. The research developed looked at the risk factors associated with the incidence of autism. Some researchers report that genetic factors play a crucial role in the occurrence of autism. Patients who have autistic siblings are at higher risk, and the risk is higher in patients who are identical twins[4-6]. Genetic and environmental factors play an important role in the development of ASD because the environment can affect particular brain structures[7].

Several studies that utilise spatial analysis show results that can help determine steps to treat autism. Research conducted in England showed a significant autocorrelation of autism incidence across all areas. Areas with a high incidence of autism are surrounded by areas with another high incidence[8]. Meanwhile, in America, it was found that there were geographic disparities in the utilization of health services by children with autism[9].

The prevalence of autism in the world is increasing every year. The Centers for Disease Control and Prevention (CDC) estimated that 1 in 59 American 8-year-old children had ASD in 2014. This figure is two times higher than in the previous two decades[10]. Globally, Baxter et al. (2015) estimated that 1 in 160 children has ASD. Maenner et al. (2020) estimated that 1 in 54 children lived with ASD in 2016. Pérez-Crespo et al. (2019) reported that ASD children increased in Catalonia, Spain, from 0.07% in 2009 to 0.23% in 2017. These figures come from high-income

countries, while data on the estimated prevalence of autism in low-income countries are still lacking.

Data on the prevalence of ASD in Indonesia are finite. The Ministry of Women's Empowerment and Child Protection of the Republic of Indonesia estimated that there are 2.4 million people with autism in Indonesia, with an increase of around 500 people per year[14]. The Ministry of Health of the Republic of Indonesia reported at least 5,530 cases of child development disorders received services at primary health centres during 2020 – 2021. This figure includes children with autism disorders[15]. Data from the Pontianak Disability and Assessment Center Services (DACS) shows an increase since its establishment in 2014. This increase needs to find the cause to reduce the occurrence of autistic disorders in the next generation. Autistic children lose years of living healthily. Globally it was estimated that people with autism experience a loss of 58 years of life per 100,000 population[11]. The government has never released data on the number of people with autism in Pontianak. This study aims to determine the number of children with autism and to map its distribution in Pontianak.

METHODS

This study is observational with a survey to obtain data on ASD children in government-owned facilities dealing with ASD children in Pontianak City. We used medical records from the Pontianak Psychiatry Hospital (PPH) and DACS records from 2015 to 2020. We only collected data on ASD children living in Pontianak. We filtered the data for possible duplication.
Overall, the data obtained from the two government-owned facilities are 147 children, consisting of 40 children of the PPH and 107 children of DACS users. There are 4 data recorded in both places, and 58 records do not have complete addresses. The determination of the coordinates was only carried out at 83 locations. The flow of data selection can be seen in Fig. 1.

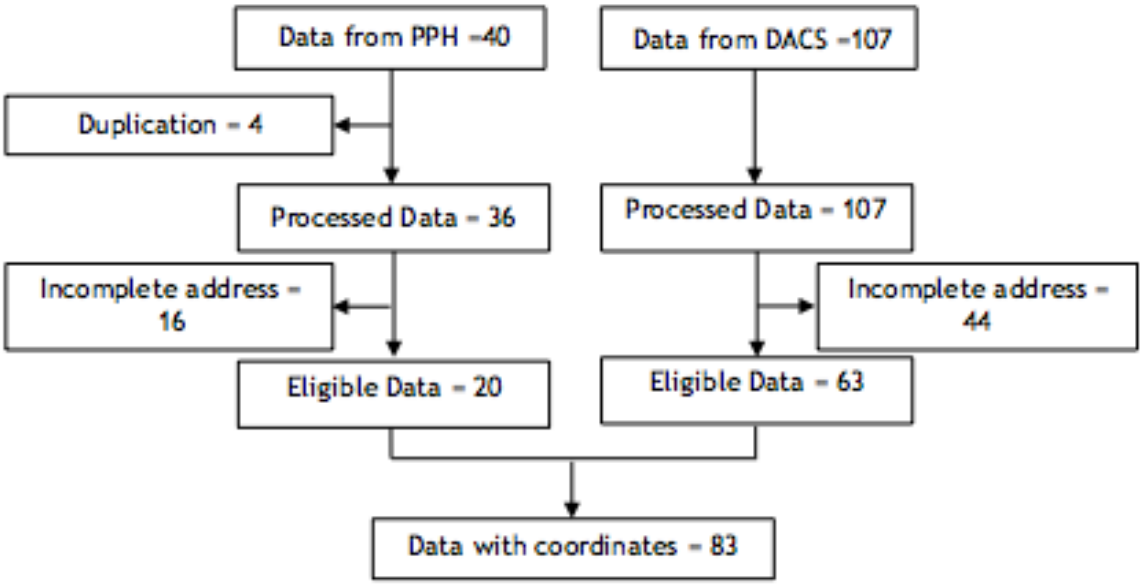

Figure 1. Data selection flowchart

To map the distribution of ASD children, we only used cases that had complete addresses. The next step was to determine the coordinates based on the existing address using the global positioning system (GPS). Spatial analysis using ArcGIS was carried out to see the distribution pattern of ASD children in Pontianak.

Ethical Consideration
This research was approved by the Health Research Ethics Committee (HREC) Politeknik Kesehatan Kemenkes Pontianak (No. 064/KEPK-PK.PKP/III/2021).

RESULTS

Table 1 shows that the children with ASD in Pontianak are mostly boys (76%). The distribution in both places is also 72% and above The age group that used the two facilities the most was the 6 - 10-year-old group (53%). When compared between the two service centers, PPH is dominated by children aged 3 – 5-year-old group (58%), while DACS is dominated by children aged 6 – 10-year-old group (58%). The most users were in 2016 and 2019 (23% each). PPH users were the most in 2019 (31%), DACS in 2016 and 2019 (33%).

Table 1: Characteristics of children with ASD

Variables	PPH		DACS		Total	
	(n=36)	%	(n=107)	%	(n=143)	%
Sex						
Boys	26	72	83	78	109	76
Girls	10	28	24	22	34	24
Age group (years)						
2	1	3	0	0	1	1
3 - 5	21	58	11	10	32	22
6 - 10	14	39	62	58	76	53
11 - 15	0	0	29	27	29	20
16 - 18	0	0	5	5	5	3
Year of treatment						
2015	NA		14	13	14	10
2016	NA		33	31	33	23
2017	7	19	18	17	25	17
2018	10	28	7	6	17	12
2019	11	31	22	21	33	23
2020	8	22	13	12	21	15

The mapping conducted on 85 children using government-owned facilities showed that ASD children were present in every sub-district (Fig. 2). In West Pontianak and Pontianak City, there is one point with two ASD children. The results of the neighboring analysis show that the distribution of ASD children in Pontianak clustered with a Nearest Neighbor Ratio of 0.897, z-score of 11.798, and p-value of 0.072 (Fig. 3). This grouping in the Sub-Districts of West Pontianak, City Pontianak, and South Pontianak. When we compared the population density in each sub-district listed in Table 2, more ASD children are in areas with high density. West Pontianak, which is the most populous sub-district, has the most children with autism. The distribution of autistic children who use services appears to be around hospitals and DACS (Fig. 2).

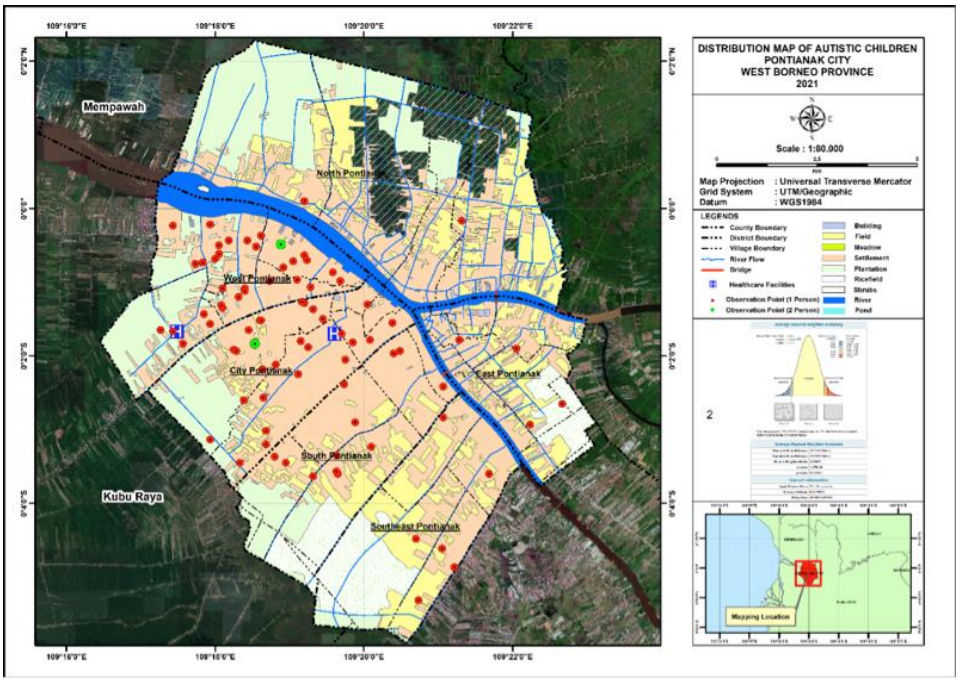

Figure 2 Spatial distribution of Children with ASD in Pontianak

Table 2: Population density in Pontianak

Sub-Districts	Number of ASD Children	Population Density per km^2*
East Pontianak	4	8,948
City Pontianak	27	7,691
West Pontianak	34	9,104
South Pontianak	12	5,503
South-east Pontianak	6	3,036
North Pontianak	2	3,511

*Source:[16]

DISCUSSION

DACS has more records of ASD children than PPH because people are more familiar with DACS as an Autism Center. The Autism Centre started operating in 2014 and not only serves children with ASD but also serves children with other disabilities[17]. In 2020 the government of Pontianak city changed the name of the Autism Center to the Disability and Assessment Center Service (DACS). Meanwhile, services for ASD children at the PPH only started in 2017 at the Growth and Development Clinic, so the DACS provides more services than the PPH.

Boys dominate the incidence of autism in Pontianak, including in PPH and DACS. The results of this study are the same as previous studies. The U.S. Department of Health and Human Services reports that the prevalence ratio of people with autism in children aged eight years ranges from 3 to almost 5-times higher in boys[10]. A systematic review concluded that the ratio of the incidence of ASD in boys to girls is 3:1[18]. Researchers have not yet obtained a firm answer to this phenomenon[19,20]. Research in China found that there were more differences in ASD candidate gene deficiency in women than men, which led to a high prevalence of ASD in men[21].

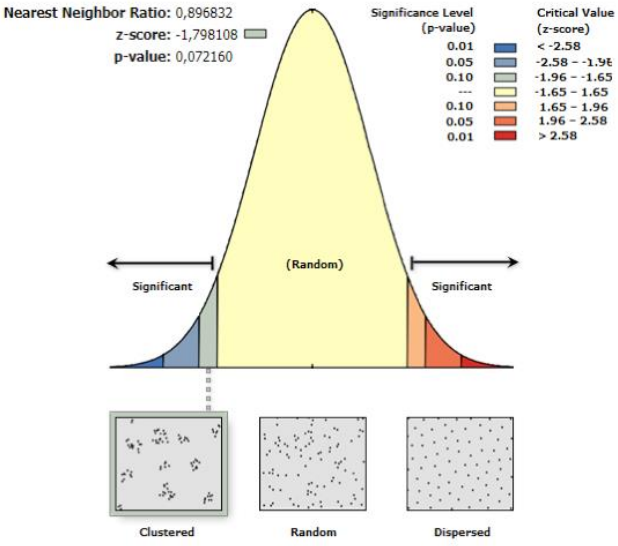

Figure 3 Nearest neighbor analysis

The results showed that the age characteristics of ASD children who used PPH were dominated by children aged 3-5 years, and data were found for children aged two years. In contrast to DACS, children aged 6-10 years dominate as users. PPH serves to determine the diagnosis of developmental delays in children. Parents who suspect that their child's development is different from other children will immediately take their child to the hospital. This condition explains the younger age group in PPH. Meanwhile, DACS is a place of therapy for school-age ASD children[22].

The distribution of ASD children in Pontianak is clustered. This clustering occurs in areas with high population density. This study supports previous studies that found the prevalence of ASD associated with proximity to urban settlements and industrial locations[23]. Generally, dense areas cause environmental pollution. A polluted environment contributes to the incidence of ASD[24]. Recent studies have reported the association of exposure to polychlorinated biphenyls (PCBs) during pregnancy with an increased risk of autism[25]. Vecchione et al. found that higher maternal fish consumption especially shellfish and large fish - during the second half of pregnancy was associated with the incidence of autism[26]. This research did not study the relationship between pollution factors and the incidence of autism in Pontianak. However, several researchers reported heavy metals in several foodstuffs like shellfish[27] and water from the Kapuas river[27-29] in Pontianak. Further research is needed to determine the impact of these pollutants on the incidence of autism.

This clustering occurs in areas where there are service facilities for ASD children. The areas of East and North Pontianak have the lowest ASD children. Even so, it does not mean that the incidence of autism is scant in this area. It could be that autistic children in this area have not been detected because the community has difficulty accessing health services for their children. Access to these two areas must be via two bridges that cross the river. The traffic is saturated[30]. While the farthest point is in the north, access to services at these two facilities is not easy. North Pontianak is an area that borders other cities so that it becomes a dense inter-city traffic lane[31]. In addition to the heavy traffic flow, the long distance is a consideration for the community to get services for ASD children. This condition shows disparities in accessing health services for children with autism. To overcome this, the local government can provide mental health professionals at community health centers in every sub-district.

The province of West Kalimantan has peat land that is a potential place to cause hot spots in the dry season. This condition is exacerbated by the community's habit of burning land and forest for agriculture or plantations. Smog is a common occurrence in this province, including in Pontianak. In addition to hot spots, movable and immovable emission sources also contribute to high levels of PM_{10} in Pontianak[32]. Several researchers have found that the incidence of autism is related to ambient air pollution during pregnancy[33-37]. Other researchers have found that exposure to air pollution in early life increases the risk of ASD[38].

The data on the characteristics of ASD children, such as ethnicity, parents' occupation, and parents' income, in both data sources are

incomplete and cannot be analyzed. This data is helpful in dealing with ASD children because the socio-cultural background is very influential in providing services to ASD children[39]. Research conducted in Bangladesh shows that family factors are one of the inhibiting factors in the early diagnosis of ASD. Stigma and denial, and financial limitations in the family of ASD children are part of the delay in diagnosing children with ASD[40]. Likewise, in the United Kingdom and Egypt, children with ASD from parents with low socioeconomic tend to experience delays in diagnosis[41,42]. If ASD children are diagnosed early, they will receive therapy that allows them to grow and develop like normal children[43].

Given the large number of data that do not have complete addresses, the study result has not been able to describe the condition of ASD children diagnosed at government-owned services in Pontianak. This research can provide an overview of the distribution of autistic children in Pontianak by paying attention to the distribution area trends. In addition, the results of this mapping can provide an overview to the Pontianak city government in providing services to ASD children. The government can integrate population registration number data for public service purposes. Thus, the government can provide the right services using the available demographic data.

CONCLUSIONS

The pattern of distribution of ASD children in Pontianak City is clustered. The grouping appears in densely populated areas. The disparity in accessing health services for child mental health is found in areas far from PPH and DACS. The local government can provide mental health workers to serve the community at each sub-district health centre. Further research is needed on the factors associated with the incidence of ASD in Pontianak City.

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Conflict of interest
The authors declared no potential conflicts of interest with respect to research, authorship, and/or publication of this article.

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