

DEMOGRAPHIC SURVEY OF MENARCHE AND MENOPAUSE AT INDUSTRIAL AREA OF MAJALAYA AND CIJERAH

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ABSTRACT

Menopause is a natural phenomenon every woman experiences at a certain age. Clinically, the onset of menarche and menopause is an important indicator of chronic illnesses risks such as heart disease, stroke, and osteoporosis that will affect the quality of a woman's life besides mortality. Demographic and industrial pollution factors affect the onset of menopause besides menstruation, menarche onset, reproductive, family and genetic, and lifestyle history, and others not yet revealed. Age range for menopause is quite wide from 40-60 years. In developed countries, average menopause age is 51 yo, whereas in developing countries it is between 44-46 yo. Indonesia is one of the countries with high pollution rates, where Bandung and other areas surrounding it is densely populated and industrialized. This research aimed to obtain data of the age of menarche and menopause onset at industrial areas. The research was conducted at Cijerah Village, Bandung Kulon Subdistrict and Padamulya Village, Majalaya Subdistrict. The design used in this research was cross-sectional, descriptive, analytic. The method applied was a survey towards 100 woman aged ranging from menarche until menopause. The expected result was to obtain data of menarche and menopause onset age at industrial areas. There was significant association between menopause onset and the distance of the house to the factory, and each respondents's menarche or menopause onset with birth mother.

Key words: menarche, menopause, industrial pollution

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Introduction

Menarche and menopause are natural phenomena in a woman's life and is an important period in physical or psychological development. Menarche is the first menstruation that a young woman experiences, a sign that the reproductive period has started. Many factors influence the onset of menarche, among others, race, ethnicity, family, nutrition, physical or psychological environment, and there are also thoughts of many more other factors. From the data obtained in developing countries, the onset of menarche onset is almost stable, ranging from 12-13 years, whereas in developing countries menarche begins later on. ⁽¹⁾

The age of menarche is an indicator of a woman's hormonal status, at 15 years of age of menarche onset, most often the menstruation cycle is irregular, will have poor reproductive history, and some research states that it is prone to develop early menopause. ^(2,3)

Menopause is the natural cease of menstruation that occurs due to permanent cessation of the ovary's primary function therefore becoming a sign of the end of the reproductive cycle. The decrease in estrogen hormone levels will cause physical and psychological changes that differs among women and does not seldomly disturb everyday life. In developed countries, the age range of menopause is around 51-52 years old, whereas in developing countries is generally earlier. Clinically, the start of menopause is an important indicator of risk factors of chronic illnesses, such as heart disease, stroke, and osteoporosis that will affect the woman's quality of life. ^(2,3,4)

With the increase of life expectancy, therefore a woman is estimated to live a third of her life in postmenopausal condition. Besides that, the amount and proportion of the female population above 50 yo is estimated to increase significantly for years to come. Based on the population census in 2000, the amount of woman above 50 yo was 15,5 million or 7,6% from the total population, whereas in the year 2020 it is estimated to increase as large as 30 million or 11,5% of the world's population. The age of menopause shifted from 46 in 1980 to 49 in 2000.

On the other hand, the increase of menopausal age causes the improvement of the woman's life due to the protection the estrogen hormone provides, but the possibility to contract malignancy diseases also demands attention, although the possibility of malignancy is far smaller than the possibility of diseases secondary to estrogen decrease.^(2,3,5)

From the myriads of factors that altogether is associated in affecting the start of menopause, such as race, family, genetic, menstrual cycle history, onset of menarche, amount of children, body mass, and other factors, the role of environmental factors needs to be considered. Indonesia as a developing country needs industrial development that gives contribution towards the increase of welfare, but on the other hand, the uncontrolled growth of industrialization causes negative effects on life, especially health. The lack of education and knowledge along with the burden of demands in basic primary needs causes the population to ignore the environment. They live around the factory, using the water supplies near the factory, not to mention the unhealthy behaviour and environmental pollution that is inevitable, such as the smoke and dust from vehicles, causing a really bad effect towards health.^(6,7)

Majalaya and Cijerah has been long known as the center of West Java's industry field, especially Bandung and the areas around it, therefore the writer decided to conduct research in this area.

Methods

This research is a cross sectional with analytic descriptive design on menopausal woman at industrial area of Padamulya Villahe and Cijerah Village, Bandung Kulon Subdistrict. This research was held from 1 - 16 February 2013.

Sample collection methods and manual

All menopausal woman in Padamulya Village, Majalaya and Cijerah Village, Bandung Kulon Subdistrict between 1 - 16 February 2013 that fulfills the inclusion criteria and agreed to participate in this research was taken as respondents.

A focused interview was conducted by residents from the Obstetric and Gynecologic Department by using questionnaires and closed-ended questions.

Data analysis

Bivariate analysis is used to find relationship between two variables, which in this study are the independent variable—menopause—which is a categoric variable; and the dependent variables—distance from home to factory, menarche age, menarche age of biological mother, and menopausal age of biological mother—which are also categoric variable. Because all variables are categoric, the test used was non-paired *chi-square* testing. To see the relationship of both variables, *chi-square* testing was done computerized with SPSS 17 program.

Results and discussion

The analysis was used for describing the characteristics of study respondents and univariate variables. This characteristic involved location, distance, age, BMI, and domicile. As for describing research variables involved working status, menarche, first menstrual cycle, first menopause, and age when menopause. This study was conducted at 2 different locations, at Cijerah and Majalaya Village with 99 respondents and 72 respondents in each area respectively, with total 171 respondents. The characteristics of respondents according to identity such as age, BMI, and domicile can be seen in Table 1.

Table 1. Characteristics of Respondents According to Identity

Category	Mean	Standard Deviation
Age (year)	44	11
BMI (kg/m ²)	23,16	4,17
Domicile Period (Years)	29	14

From the table, age category, the mean of age was 44 years old from 99 respondents in Cijerah, bigger than standard deviation of age which is 11 years old. This showed that there was a little gap between maximum and minimum age of respondents.

For BMI category, 99 respondents from Cijerah had BMI mean of 23,61 whereas 4,17 for standard deviation. This showed that there was a little gap between maximum and minimum BMI of respondents. The mean of BMI was within normal limit because of 18 – 30 of normal BMI range.

For domicile category, the mean of time of domicile in 99 respondents from Cijerah was 29 years old, bigger than standard deviation which was 14 years old. This showed that there was a little gap between maximum and minimum time of domicile of respondents.

Characteristics of respondents according to home to factory distance

Description of home to factory distance could be seen in Table 2.

Table 2. Home to Factory distance

Distance	N	%
Near	85	85,86%
Far	14	14,14%
Total	99	100,00%

From 99 respondents in Cijerah, 85 respondents (85,86%) had a home near the factory and 14 respondents (14,14%) far from factory.

Characteristics of respondents according to working status

The description of working status could be seen on Table 3.

Table 3 Response about Working Status

Working Status	N	%
Not Work	87	87,88%
Working at Factory	12	12,12%
Total	99	100,00%

In 99 Cijerah respondents, 87 respondents (87,88%) had not worked and 12 respondents (12,12%) worked at the factory.

Characteristics of Respondents According to Menarche Age

The description for age of menarche could be seen in Table 4.

Table 4 Response of Menarche Age

Menarche	N	%
< 12 y.o	7	7,07%
13 y.o - 15 y.o	73	73,74%
> 15 y.o	19	19,19%
Total	99	100,00 %

In 99 respondents of Cijerah, 73 respondents (73,34%) had menarche at the age of 13 to 15 years old and 19 respondents (19,9%) at the age over 15 years old. The rest (7,07%) was at below 12 years old.

Characteristics of respondents according to mother's age of menarche

The description for mother's age of menarche could be seen in table 5.

Table 5. Response of Mother's Age of Menarche

Mother's Menarche Age	N	%
< 12 y.o	20	20,20%
13 y.o - 15 y.o	67	67,68%
> 15 y.o	12	12,12%
Total	99	100,00%

From 99 respondents from Cijerah, the mother's age of menarche at the age 13 to 15 years old, over 15 years old, and below 12 years old were 67 (67,68%), 20 (20,20%), and 12 (12,12%) respectively.

Characteristics of respondents based on menopause variable

Characteristics of respondents based on menopause variable obtained from the responses to respondents's questionnaire can be seen in table 6.

Table 4.6. Respondents's Responses on Menopause

Menopause	N	%
Premenopause	70	70,71%
Menopause	29	29,29%
Total Respondents	99	100,00%

Table 6 shows the proportion of the menopause variable from 99 respondents in Cijerah. About 70 respondents (70.71%) was not yet attained menopause (premenopausal respondents) and 29 respondents (29.29%) was menopausal respondents.

Regarding to these data the characteristics of the 29 respondents who had menopause can be seen in Table 7.

Table 7. Menopausal Respondents's Characteristics

Category	Average (years of age)	Standard Deviation
Menopause	48	10

Seen from Table 7 the average age of 29 respondents who had menopause in Cijerah was 48 years old, that was bigger than the standard deviation of menopausal respondents's age which was 10 years. This smaller standard deviation value than the average age indicates a small gap between the maximum and minimum age of menopausal respondents.

Characteristics of respondents based on biological mother's age of menopause variable

Characteristics of respondents based on biological mother's age of menopause variable obtained from the responses to respondents's questionnaire can be seen in Table 8.

Table 4.8. Biological Mother's Age of Menopause

Biological Mother Age of Menopause (Years Old)	N	%
40 – 50	40	40,40%
51 – 55	56	56,57%
> 55	3	3,03%
Total Respondents	99	100,00%

Table 8 shows the proportion of biological mother's age of menopause from 99 respondents in Cijerah. About 56 (56.57%) respondents's mother attained menopause at 51 – 55 years old, 40 (40.40%) respondents's mother attained menopause at 40 – 50 years old, while 3 (3.03 %) respondents's mother attained menopause after 55 years old.

Descriptive analysis of respondents characteristics in Majalaya**Characteristics of respondents based on identity**

Characteristics of respondents based on identity consist of age, BMI, and length of domicile can be seen in Table 9.

Table 9. Characteristics of Respondents Based on Identity

Category	Average	Standard Deviation
Age	51 years old	7
BMI	22,84	3,86
Length of Domicile	35 years	15

Seen from Table 9, for age category, of 72 respondents in Majalaya, the average age of respondents was 51 years old, greater than the standard deviation which was seven years. The smaller standard deviation value than the average age indicates a small gap between the minimum and maximum age of respondents.

For BMI category, of 72 respondents in Majalaya, the average BMI value of respondents was 22.84 greater than the standard deviation which was 3.86. The smaller standard deviation value than the average value indicates a small gap between the minimum and maximum BMI value of respondents. This average value of BMI can be considered as normal because included in normal range of BMI that are 18 to 30.

As for the length of domicile category, of the 77 respondents in Majalaya the average length of respondents domiciled in Majalaya was 35 years, greater than the standard deviation which was seven years. The smaller standard deviation value than the average domiciled length indicates a small gap between the minimum and maximum length of respondents domiciled in Majalaya. The average length of respondents domiciled in Majalaya shows that most of respondents was native of Majalaya.

Characteristics of respondents based on the distance between home and workplace variable

Characteristics of respondents based on the distance between home and workplace (place of activity) obtained from the responses to respondents's questionnaire can be seen in table 10.

Table 10. Distance Between Home and Workplace

Distance	N	%
Short distance	56	77,78%
Long distance	16	22,22%
Total	72	100,00%

Table 10 and shows the proportion of the distance between home and workplace from 72 respondents in Majalaya. About more than three quarter or 56 respondents (77.78%) stay close from the workplace and 12 respondents (22.22%) stay away from the workplace.

Characteristics of respondents based on work status variable

Characteristics of respondents based on work status obtained from the responses to respondents's questionnaire can be seen in table 11.

Table 4.11 Respondents Work Status

Work Status	N	%
Unemployed	67	93,06%
Factory worker	5	6,94%
Total	72	100,00%

Table 11 shows the proportion of the work status from 72 respondents in Majalaya. About 67 respondents or 93.06% was unemployed and five respondents or 6.94% was factory worker.

Characteristics of respondents based on menarche variable

Characteristics of respondents based on age of menarche obtained from the responses to respondents's questionnaire can be seen in table 12.

Table 12. Age of Menarche

Menarche (years old)	N	%
< 12	5	6,94%
13 - 15	47	65,28%
> 15	20	27,78%
Total respondents	72	100,00%

Table 12 shows the proportion of menarche variable from 72 respondents in Majalaya. About more than half respondents or 47 respondents (65.28%) attained menarche by 13 to 15 years old, 20 respondents (27.78%) attained menarche after 15 years old, while five respondents (6.94%) attained menarche before 12 years old.

Characteristics of respondents based on biological mother's age of menarche

Characteristics of respondents based on biological mother's age of menarche obtained from the responses to respondents's questionnaire can be seen in table 13.

Table 13. Biological Mother's Age of Menarche

Biological Mother's Age of Menarche (years old)	N	%
< 12	4	5,56%
13 - 15	42	58,33%
> 15	26	36,11%
Total respondents	72	100,00%

Table 13 shows the proportion of biological mother's age of menarche variable from 72 respondents in Majalaya. About more than half respondents or 42 respondents (58.33%) attained menarche by 13 to 15 years old, 26 respondents (36.11%) attained menarche after 15 years old, while four respondents (5.56%) attained menarche before 12 years old.

Characteristics of respondents based on menopause variable

Characteristics of respondents based on menopause variable obtained from the responses to respondents's questionnaire can be seen in table 14.

Table 14. Respondents's Responses on Menopause

Menopause	N	%
Premenopause	14	19,44%
Menopause	58	80,56%
Total respondents	72	100,00%

Table 14 shows the proportion of the menopause variable from 72 respondents in Majalaya. About 58 respondents (80.56%) was menopausal respondents and 14 respondents (19.44%) was not yet attained menopause (premenopausal respondents).

Regarding to these data the characteristics of 58 menopausal respondents can be seen in Table 15.

Table 4.15. Characteristics of Menopausal Respondents

Category	Average (years of age)	Standard Deviation
Menopausal	48	4

Seen from Table 15 the average age of 58 respondents who had menopause in Majalaya was 48 years old, that was bigger than the standard deviation of menopausal respondents's age which was 10 years. This smaller standard deviation value than the average age indicates a small gap between the maximum and minimum age of menopausal respondents.

Characteristics of respondents based on biological mother's age of menopause variable

Characteristics of respondents based on biological mother's age of menopause variable obtained from the responses to respondents's questionnaire can be seen in Table 16.

Table 16. Biological Mother Age of Menopause

Biological Mother Age of Menopause (Years Old)	N	%
40 - 50	22	30,56%
51 - 55	45	62,50%
> 55	5	6,94%
Total respondents	72	100,00%

According to Table 16, the calculation results of menopausal age varies among biological mothers from 72 respondents in Majalaya area, which are as follow: 45 respondents (62,5%) had their biological mother having menopause by the age 51 to 55 years old; 22 respondents (30,56%) had their biological mother having menopause by the age 40 to 50 years old; and 5 respondents (6,94%) had their biological mother having menopause by the age more than 55 years old.

Relationship between menopause and distance from home to factory

Table 17. Crosstabulation of Menopause and Distance from home to factory

Variable		Menopause		Total	
		Not yet Menopause (Menopause)	Already Menopause (Menopause)		
Distance	Near	Count	76	65	141
		Expected Count	69.3	71.7	141.0
Distance	Far	Count	8	22	30
		Expected Count	14.7	15.3	30.0
Total		Count	84	87	171
		Expected Count	84.0	87.0	171.0

From the cross tabulation output above, there are no observed and expected values less than 5 in this 2 x 2 table. Therefore, this 2 x 2 table is available to be tested with *chi-square*.

Table 18. Chi-Square Testing of Menopause and Distance from home to factory

	Value	dN	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	7.341 ^a	1	,007		
Continuity Correction ^b	6,292	1	,012		
Likelihood Ratio	7,600	1	,006		
Nisher's Exact Test				,009	,006
Linear-by-Linear Association	7,298	1	,007		
N oN Valid Cases	171				

Above outputs are the result of *chi-square* testing, with the value used is the *Pearson Chi-Square* value. With H_0 rejection criteria if p value $> 0,05$, where significancy value found was 0.007 (p value < 0.05), therefore H_0 was rejected. In conclusion, there is a significant relationship between menopause and distance from home to factory.

A lot of corresponding factors plays role in menopause, which made it difficult to determine, but with this significant association found between menopause and distance from home to factory, industrial pollutants can be considered. Definite evidence will need more accurate research on type of pollutants entering the body. Majalaya and Cijerah were a center for industry especially textile industry, and people's houses were generally very near the factory. In Cijerah, residents who stayed near the factory used water from the factory. In location categorized as far (more than radius 2 km), residents did not use water from factory. Pollutants from any source will enter the body circulation and most of them will bind Hb, resulting in various organ disturbances. Textile fiber industry process leaves pollutants not only volatile but also liquid waste, which are specifically toxic to the ovaries.

Relationship between menopause and menarche

Table 19. Crosstabulation of Menopause And Menarche

		Menopause		Total	
		Not yet Menopause	Already Menopause		
Menarche	<12 years old	Count	5	7	12
		Expected Count	5.9	6.1	12.0
	13-15 years old	Count	64	56	120
		Expected Count	58.9	61.1	120.0
	>15 years old	Count	15	24	39
		Expected Count	19.2	19.8	39.0
Total	Count	84	87	171	
	Expected Count	84.0	87.0	171.0	

From the cross tabulation output above, there are no observed and expected values less than 5 in this 2 x 2 table. Therefore, this 2 x 2 table is available to be tested with *chi-square*.

Tabel 20. Chi-Square Testing of Menopause And Menarche

	Value	dN	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.892 ^a	2	.236
Likelihood Ratio	2.912	2	.233
Linear-by-Linear Association	.906	1	.341
N of Valid Cases	171		

Above outputs are the result of *chi-square* testing, with the value used is the *Pearson Chi-Square* value. With H_0 rejection criteria if p value < 0,05, where significance

value found was 0.236 (p value > 0.05), therefore H_0 was accepted. In conclusion, there is no significant association between menopause and menarche. This is in accordant with other previous studies. Between menarche and menopause is a long period and a lot of factors influencing by this period, even though some studies mentioned that if menarche age was more than 15 years old and there were menstrual disturbances for a couple of years, showed earlier menopausal age due to poor hormonal status.

Relationship between menarche age and biological mother's menarche age

Tabel 21. Crosstabulation of Menarche Age and Biological Mother's Menarche Age

		Menarche			Total	
		<12 years old	13-15 years old	>15 years old		
Biological Mother's Menarche Age	<12 years old	Count	5	22	4	31
		Expected Count	2,1	21,3	7,5	31,0
	13-15 years old	Count	11	132	23	166
		Expected Count	11,4	114,2	40,4	166,0
	<15 years old	Count	2	27	37	66
		Expected Count	4,5	45,4	16,1	66,0
Total	Count	18	181	64	263	
	Expected Count	18,0	181,0	64,0	263,0	

From the crosstabulation output above, there are observed and expected values less than 5 in this 2 x 3 table. Therefore, this 2 x 3 table is available to be tested with *chi-square* or Kolmogorov-Smirnov.

Tabel 22. Chi-Square Testing of Respondents' Menarche Age And Biological Mother's Menarche Age

	Value	dN	Asymp. Sig. (2-sided)
Pearson Chi-Square	52,026 ^a	4	,000
Likelihood Ratio	46,778	4	,000
Linear-by-Linear Association	34,249	1	,000
N of Valid Cases	263		

Above outputs are the result of *chi-square* testing, with the value used is the *Pearson Chi-Square* value. With H_0 rejection criteria if p value $> 0,05$, where significance value found was 0.000 (p value < 0.05), therefore H_0 was rejected. In conclusion, there is a significant association between respondents' menarche age and biological mother's menarche age. Literature studies mentioned that a female's hormonal status is influenced by a number of factors, including familial and genetic factors, which had been proved more accurately with chromosome examination.

Relationship between respondents' menopause and their biological mother's menopausal age

Tabel 23. Crosstabulations of Respondents' Menopause and Their Biological Mother's Menopausal Age

		Menopause		Total	
		Not yet Menopause (Menopause)	Already Menopause (Menopause)		
Biological Mother's Menopause	40-50 years old	Count	23	39	62
		Expected Count	30,5	31,5	62,0
	51-55 years old	Count	58	43	101
		Expected Count	49,6	51,4	101,0
	>55 years old	Count	3	5	8
		Expected Count	3,9	4,1	8,0
Total	Count	84	87	171	
	Expected Count	84,0	87,0	171,0	

From the crosstabulation output above, there are observed and expected values less than 5 in this 2 x 3 table. Therefore, this 2 x 3 table is available to be tested with *chi-square* or Kolmogorov-Smirnov.

Tabel 24. Chi-Square Testing of Respondents' Menopause And Their Biological Mother's Menopausal Age

	Value	dN	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.806 ^a	2	,033
Likelihood Ratio	6,865	2	,032
Linear-by-Linear Association	3,200	1	,074
N of Valid Cases	171		

Above outputs are the result of *chi-square* testing, with the value used is the *Pearson Chi-Square* value. With H_0 rejection criteria if p value $> 0,05$, where significancy value found was 0.033 (p value < 0.05), therefore H_0 was rejected. In conclusion, there is a significant relationship between menopause and biological mother's menopausal age. This finding can be explained with renowned familial factors mentioned earlier.

Conclusion

- There is a significant association between menopausal age and distance from home to factory.
- There is a significant association between subjects' and their biological mothers' menarche age.
- There is a significant association between subjects' and their biological mothers' menopausal age.

Suggestions

Further studies needed about types of pollutant components and exposure durations with alteration of menstrual patterns.

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