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RESEARCH

METABOLIC SYNDROME AMONG ADULTS IN RURAL AREAS

(Sindrom Metabolik pada Dewasa di Daerah Pedesaan)

Fenty, Widayati A, Virginia DM, Hendra P

ABSTRAK

Sindrom metabolik merupakan sekumpulan tanda yang dicirikan dengan kondisi dislipidemia, peningkatan tekanan darah dan kadar glukosa darah puasa serta kegemukan daerah perut. Sindrom metabolik telah menjadi salah satu masalah kesehatan di negara berkembang. Penelitian menunjukkan ada peningkatan prevalensi sehubungan sindrom metabolik, tetapi sebagian besar kajian dilakukan di daerah perkotaan. Tujuan penelitian ini adalah untuk mengetahui prevalensi sehubungan sindrom metabolik, di populasi dewasa yang berusia di atas 40 tahun di daerah pedesaan di Yogyakarta dengan cara menilainya. Penelitian ini menggunakan rancangan potong lintang yang dilaksanakan antara bulan Mei–Juni 2015 di Cangkringan Yogyakarta. Pengambilan data meliputi sosiodemografi melalui wawancara, pengukuran antropometrik dan tekanan darah, serta kadar glukosa darah serta profil lipid. Responden penelitian terdiri dari 50 laki-laki dan 50 perempuan dewasa usia ≥ 40 tahun. Batasan sindrom metabolik, menggunakan patokan International Diabetes Federation (IDF). Prevalensi sindrom metabolik berdasarkan patokan IDF di daerah pedesaan di Cangkringan Yogyakarta sebesar 25%. Sindrom metabolik, lebih banyak ditemukan di perempuan (32%) daripada laki-laki (18%). Komponen terbanyak dari sindrom metabolik adalah peningkatan tekanan darah di semua responden penelitian, kemudian diikuti dengan komponen kegemukan perut dan kadar HDL yang rendah di perempuan, sedangkan di laki-laki diikuti dengan hipertrigliseridemia. Prevalensi sindrom metabolik cukup tinggi di daerah pedesaan Yogyakarta khususnya bagi perempuan. Pencegahan terhadap sindrom metabolik menjadi keutamaan kesehatan masyarakat dalam menurunkan penyakit kardiovaskular di daerah pedesaan di Yogyakarta.

Kata kunci: Sindrom metabolik, dewasa, daerah pedesaan

ABSTRACT

Metabolic Syndrome (MetS) is a collective symptom that can lead to dyslipidemia, elevated blood pressure, high fasting blood glucose, and abdominal obesity. It has become one of the greatest problems in developing countries, such as Indonesia. Many studies mostly focused on the population in urban area show that the prevalence of MetS has been rising. Therefore, this research aimed to know the prevalence of MetS among adults over 40 years in the rural area of Yogyakarta. This study was conducted from May to June 2015 in Cangkringan, Yogyakarta using cross-sectional method. Certain examinations were carried out on 100 subjects, namely 50 females and 50 males aged more than 40 years old through personal interview, anthropometric and blood pressure measurement, as well as blood glucose and lipid measurement. This research also used the International Diabetes Federation (IDF) Consensus Worldwide Definition of the MetS. Prevalence of MetS was measured based on IDF criteria. The result found that there were 25% of subjects in the rural area of Cangkringan, Yogyakarta. The result also found that the prevalence of MetS in females was higher, about 32%, than in males (18%). The most common MetS component in all those subjects was the increasing of blood pressure followed by abdominal obesity and reduced high-density lipoprotein cholesterol (HDL-C) level in the female subjects, whereas elevated Triglycerides in males. The prevalence of MetS was higher in the rural area of Yogyakarta, especially among females. Therefore, the prevention of MetS should be a public health priority to reduce cardiovascular diseases in the rural area of Yogyakarta.

Key words: Metabolic syndrome, adults, rural area

INTRODUCTION

Metabolic Syndrome (MetS) is a set of risk factors consisting of dyslipidemia (elevated triglyceride level

and decreased HDL cholesterol level, increased blood pressure, increased fasting blood glucose level and abdominal obesity.^{1,2} Epidemiological researches have shown that metabolic syndrome still can be found

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since there is no change in community's lifestyle. The increased prevalence of this metabolic syndrome can lead to health problems in the community.^{1,3}

The prevalence of MetS, moreover, is estimated to be approximately between 20–25% of the total adult population in the world. Individuals with MetS will have a risk of cardiovascular disease and stroke twice compared with individuals without MetS. Metabolic syndrome can also increase the risk of type 2 diabetes mellitus five times.^{3–5}

In developing countries, the prevalence of MetS has also increased. Some researches showed that the prevalence of MetS in developing countries, is as follows; Philippines (19%), Malaysia (24.2%), India (28.8%), Turkey (33.4%), Brazil (25.4%), Iran (33.7%) and Venezuela (31.2%).^{2,6} In China, cardiovascular disease causes the increase of morbidity and mortality rate, approximately about 41% of deaths per year. The increase of mortality rate due to cardiovascular disease is mostly found in rural population compared to urban area.⁷ Some researches on rural areas in some countries showed different prevalences of MetS, namely India (9.2%), Brazil (21.6 %), China (39%) and Australia (33.7% for males; 30.1% for females).^{2,8–10}

The epidemiological researches on the prevalence of MetS in Indonesia however, are still rare, particularly in rural areas. The prevalence of MetS in rural areas of Indonesia was great indicating that people aged more than 15 years old had lipid abnormalities, namely LDL (60.7%) and HDL (24.4%). The prevalence of cardiovascular in rural areas (19.5%) was almost the same as in urban areas (23.4%). Hypertension in rural areas was fairly high (34.9%) and so was diabetes (2.7%).¹¹

Several researches, moreover, showed the prevalence of MetS in Indonesia as follows; Jakarta (28.4%), Napier (33.9%), Jayapura (33.9%), Bali (18.2%) and Bogor (36.2%).^{12–15} A research conducted by Bantas et.al using Basic Health Research data in 2007 showed that the prevalence of MetS in urban areas of Indonesia was 17.5%.¹⁶ The majority of individuals with metabolic syndrome has a high risk of type 2 diabetes. A research conducted by Wulandari and Isfandiari also stated that the prevalence of MetS in patients who had type 2 DM was 71.6%.¹⁷

Finally, the previous researches on the prevalence of MetS in Indonesia were mostly conducted in urban areas. The existence of differences in sociodemographic characteristics of communities can create a difference in research results.¹⁸ Therefore, further researches on MetS are needed to be conducted, especially in rural areas in Yogyakarta.

METHODS

The subjects in this research were people living in the rural areas on Yogyakarta, namely Kepuharjo, Cangkringan, Sleman, and D.I. Yogyakarta. Those subjects had to meet some research criteria, namely age between 40–60 years old, no history of cardiometabolic diseases, edema and drug consumption, especially associated with cardiometabolic and they had to be willing to participate in this research (confirmed with letter of consent).

Cangkringan consists of five (5) villages and 73 sub-villages. Kepuharjo village was chosen as a place of the research based on consideration of the location and geographical conditions that represent rural communities. For instance, most villagers work as farmers in Kepuharjo.

This research was an observational research with cross sectional design and nonrandom sampling method. Permission of this research was published by Bapeda District, Sleman. This research also had received permission from the Research Ethics Committee of Faculty of Medicine with No. Ethical clearance KF/FK/502/EC. Subjects participating in this research were voluntary by signing a letter of approval.

The data of this research were collected from May to June 2015. The data included sociodemographic and anthropometric data, namely waist circumference, blood pressure, as well as lipid and blood glucose profiles. Sociodemographic data were associated with age and gender obtained through interviews with the subjects. Next, the measurement of waist was conducted using Butterfly® measuring tape. Blood pressure measurement then was conducted using HEM-7203-type Omron® digital sphygmomanometer. Data of sociodemographics, waist circumference and blood pressure were collected by trained staff.

Afterwards, venous blood sampling was taken as much as 5 mL of each subject who had fasted for 10–12 hours. The measurement of lipid profiles and blood glucose was then conducted using a chemical instrument, type C 501 Roche analyzer. Finally, data obtained were presented descriptively and analyzed by Chi Square with a confidence level of 95%.

RESULTS AND DISCUSSION

In this research, the number of respondents who agreed to be the subjects of the research consisted of 50 males and 50 females. The characteristics of the subjects can be seen in Table 1.

The range of the subjects' age was 40–60 years old. Age is a risk factor that cannot be modified as a

Table 1. The characteristics of the research subjects based on sex

Characteristics	Males (n=50)	Females (n=50)
Age (years old)	49.5 (40–60)	45 (40–53)
BMI(kg/m ²)	24.4 (19.6–32.8)	25.3 (17.4–47.7)
Waist circumference (cm)	82 (67–108)	83.4 (79.6–87)
Triglycerides (mg/dL)	122 (34–807)	99.5 (48–218)
HDL(mg/dL)	50 (23–78)	52 (36–82)
Systolic blood pressure (mmHg)	135.5(97–190)	139 (109–199)
Diastolic blood pressure (mmHg)	84 (64–109)	81 (69–113)
Fasting blood glucose (mg/dL)	88 (72–174)	86 (75–288)

Description: The median (minimum-maximum)

Table 2. Comparison between SM and its components in research respondents based on gender

All variables (n=100)	Males (n=50) n (%)	Females (n=50) n (%)	Total n (%)	P
Abdominal obesity	12 (24%)	28 (56%)	40 (40%)	0.007*
Hypertriglyceride	18 (36%)	6 (12%)	24 (24%)	0.005*
Low HDL level	4 (8%)	20 (40%)	24 (24%)	0.000*
Blood pressure ≥130/85 mmHg	32 (64%)	35 (68%)	67 (67%)	0.523
Fasting blood sugar ≥ 100mg/dL	10 (20%)	7 (4%)	17 (17%)	0.424
MetS (Based on IDF)	9 (18%)	16 (32%)	25 (25%)	0.106

person's age increases. The risk of MetS can trigger type 2 diabetes and cardiovascular disease. Thus, individuals with MetS, especially over the age of 40 years old, will have a higher risk of complications of cardiovascular disease.¹⁹

The median of BMI of those female subjects was 25.3 (grade 1 overweight), while the median BMI of those male subjects was 24.4 (overweight risk).²⁰ This indicated that female subjects had a higher risk of cardiovascular disease than male subjects.

Table 2 shows the distribution of MetS and its components of the research subjects based on sex. The prevalence of MetS found, according to IDF³, was 25%, with the ratio of the prevalence of MetS in the female subjects (32%) compared to the male subjects (18%).

The research results found that Cangkringan, Yogyakarta had similar characteristics and conditions to those in other areas in Indonesia. A research on 1,591 subjects aged 25–64 years old in Jakarta conducted by Soewondo *et al.*¹² in 2006 showed that the prevalence of MetS in females was 30.4%, while in males was 25.4%.¹² Another research on 13,262 subjects in Jakarta in 2007 also showed that the prevalence of MetS in females (21.3%) was higher than in males (12.9%).¹⁶ Similarly, a research on 1,200 subjects in Jayapura in 2012 showed that the prevalence of MetS in females (36.7%) was higher than in males (25.3%).¹⁴ Research on seven (7) villages in Bali showed that the prevalence of MetS in males (16.6%) was lower than in females (20.0%).¹³

Furthermore, the prevalence of MetS in some other countries, especially in rural areas also shows the

same result, which is that the prevalence of disease in females is higher than in males. For instance, the prevalence in females is higher than in males in several countries, such as India (66.36% vs 33.63%), Brazil (33.6% vs 7.7%) and China (45.6% vs 31.4%).^{2,8,9} In contrast to those countries, the prevalence of MetS in males (33.7%) in the rural areas of Australia was higher than in females (30.1%).¹⁰ The most dominant component of MetS was blood pressure (≥130/85 mmHg) about 67%. It means that there was no significant difference of blood pressure in males and females (p=0.673). Similarly, researches in Brazil and China also showed that the increase in arterial blood pressure had triggered the significant difference of blood pressure in males and females, 62.5% and 67.2% respectively.^{2,9}

Thus, when hypertension and MetS components simultaneously occurred in an individual, there will be a synergism increasing a risk of cardiovascular disease.²¹ In Cangkringan, Yogyakarta, MetS components triggering the prevalence of MetS in the female subjects were increased blood pressure (68%), abdominal obesity (56%) and HDL level less than 50 mg/dL (40%). Abdominal obesity was considered as a risk factor in the prevalence of cardiovascular disease more meaningful than BMI.

In addition, several researches showed that abdominal circumference is an independent risk factor for cardiovascular disease, both in females with overweight or in females with normal weight.²² Low HDL level can cause atherogenic dyslipidemia. This is because HDL acts as anti-atherogenic and

anti-inflammatory as well as has an ability to resist modification of LDL. Obesity also plays a role to reduce HDL level.⁴

Moreover, in Cangkringan, Yogyakarta, MetS components triggering the prevalence of MetS in the male subjects were increased blood pressure (68%), hypertriglyceridemia (36%) and abdominal obesity (24%). Increased blood pressure, accumulation of abdominal fat (abdominal obesity), and impaired balance of blood fats (dyslipidemia) are considered as a series of symptoms resulted from insulin resistance. Metabolic syndrome occurs when insulin resistance is in cooperation with dyslipidemia as well as increased blood pressure.^{17,23}

Finally, the results of this research showed that the high prevalence of MetS in rural area, Cangkringan, Yogyakarta, was 25%. The results of this research also suggested that blood pressure, abdominal obesity and dyslipidemia (hypertriglyceridemia and low HDL levels) can contribute to the prevalence of MetS in rural areas. Besides that, this research provided an important explanation for the planning and implementation of health programs to rural communities, particularly in preventing MetS that can increase the prevalence of cardiovascular disease. As a result, simple programs, such as measuring waist circumference can be applied in rural communities as abdominal obesity screening condition.

CONCLUSION

In conclusion, the prevalence of MetS in rural areas of Yogyakarta, according to IDF standards, was 25%. The prevalence of MetS in females was higher than in males.

REFERENCES

1. Alberti KG, Eckel RH, Grundy SM, Zimmet PZ, Cleeman JI, *et al.* Harmonizing the metabolic Syndrome: a joint interim statement of the International Diabetes Federation task Force on Epidemiology and Prevention National Heart, Lung, and Blood Institute; American Heart Association; World Health Federation; International Atherosclerosis Society; and International Association for the Study of Obesity. *Circulation*.2009; 120(16): 1640-45.
2. Yu S, Guo X, Yang H, Zheng L & Sun Y. An Update on the prevalence of Metabolic Syndrome and Its Associated factors in rural northeast China, *BMC Public Health*.2014; 14(877): 1-9.
3. International Diabetes Federation. The IDF consensus worldwide definition of the metabolic syndrome. 2006. <http://www.idf.org/metabolicsyndrome>. diakses 12 Desember 2015.
4. Grundy SM. Obesity, Metabolic Syndrome, and Cardiovascular Disease. *The Journal of Clinical Endocrinology & Metabolism*. 2004; 89(6): 2595-600.
5. Grundy SM. Metabolic Syndrome Pandemic. *Arterioscler Thromb Vasc Biol*.2008; 28(4): 629-36.
6. Misra A, Khurana L. Obesity and the metabolic Syndrome in developing countries. *J Clin endocrinol Metab*.2008; 93(suppl 1): 59530.
7. Hu SS, Kong LZ, Gao RL, Zhu ML, Wang W, *et al.* Outline of the report on Cardiovascular disease in China, 2010. *Biomed Environ Sci*. 2012; 25(3): 251-6.
8. Pathania D, Bunger R, Mishra P, Pathak R, & Arora A. A Study to Assess Prevalence of Metabolic Syndrome and its Socio Demographic Risk Factor in Rural Area of District Ambala, Haryana. *J Community Med Health Educ*.2013; 3(5): 1-4.
9. Melendez GV, Gazzinelli A, Oliveira, RC, Pimenta, AM, & Kac G. Prevalence of Metabolic syndrome in rural area of Brazil, Sao Paulo. *Med J*, 2007; 125(3): 155-62.
10. Janus ED, Laatikainen T, Dunbar JA, Kilkkinen A, Bunker SJ, Philpot B, *et al.* Overweight, obesity and Metabolic Syndrome in rural southeastern Australia. *MJA*, 2007; 187(3): 147-52.
11. Kementerian Kesehatan RI. Riset Kesehatan Dasar, Jakarta, Bakti Husada, 2013; 5: 258-60.
12. Soewondo P, Purnamasari D, Oemardi M, Waspadji S, Soegondo S. Prevalence of Metabolic Syndrome Using NCEP/ATP III Criteria in Jakarta, Indonesia: The Jakarta Primary Non Communicable Disease Risk Factors Surveillance 2006. *Acta Med Indones J Intern Med*. 2010; 42(4): 199-203.
13. Dwipayana MP, Suastika K, Saraswati IMR, Gotera W, Budhiarta AAG, Sutanegara, *et al.* Prevalensi Sindrom Metabolik pada Populasi Penduduk Bali. Indonesia, *Journal Penyakit Dalam*, 2011; 12(1): 1-5.
14. Oktavian A, Salim L, Sandjaja B. Sindrom metabolik di Kota Jayapura. *Bul. Penelit. Kesehatan*. 2013; 41(4): 200-6.
15. Muherdiyantiningsih, Ernawati F, Efendi R, Herman S. Sindrom Metabolik Pada Orang Dewasa Gemuk di Wilayah Bogor. *Penelitian Gizi dan Makanan*. 2008; 31(2): 75-81.
16. Bantas K, Yosef HK, Moelyono B. Perbedaan Gender pada Kejadian Sindrom Metabolik pada penduduk perkotaan di Indonesia. *Jurnal Kesehatan Masyarakat Nasional*. 2012; 7(5): 219.
17. Wulandari MY & Isfandiari MA. Kaitan Sindroma Metabolik dan Gaya Hidup Dengan Gejala Komplikasi Mikrovaskuler. *Jurnal Berkala Epidemiologi*, 2012; 1(2): 224-33.
18. Hujova Z, and Lesniakova M., Anthropometric Risk Factors of Atherosclerosis: Differences between Urban and Rural East-Slovakian Children and Adolescents. *Bratislav Lek Listy*.2011; 112(9): 491-96.
19. Tachebele B, Abebe M, Addis Z, & Mesfin N. Metabolic Syndrome among Hypertensive Patients at University on Gondar Hospital, North West Ethiopia: a Cross Sectional Study. *BMC Cardiovascular Disorder*.2014; 14(177): 1-9.
20. Lukito AA, Rahajoe AU, Rilantono LI, Harimurti GM, Soesanto AM, Danny SS *et al.* Pedoman Tatalaksana pencegahan penyakit Kardiovaskular pada Perempuan, Edisi Pertama, Perhimpunan Dokter Spesialis Kardiovaskular Indonesia, 2015; 26-7, [http://www.inaheart.org/upload/file/Women_Guideline-Fix\(5\).pdf](http://www.inaheart.org/upload/file/Women_Guideline-Fix(5).pdf), diakses 22 September 2015.
21. Moreira GC, Cipullo JP, Ciorlia LAS, Cesarino CB, Vilela-Martin JF. Prevalence of Metabolic Syndrome: Association with Risk Factors and Cardiovascular Complications in an Urban Population. *PLoS ONE* 2014; 9(9): 1-10. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0105056>, diakses pada 22 September 2015.
22. Kulie T, Slattengren A, Redmer J, Counts H, Eglash A, MD, Schrage S. Obesity and Women's Health: An Evidence-Based Review. *J Am Board Fam Med*. 2011; 24(1): 75- 85.
23. Huang PL. A comprehensive definition for metabolic syndrome. *Dis Model Mech*. 2009; 2(5-6): 231-7.