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RELATIONSHIP BETWEEN FAMILY HISTORY OF HYPERTENSION AND SMOKING HABITS WITH INCIDENCE OF HYPERTENSION AMONG ADOLESCENTS IN PALEMBANG

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ABSTRACT

Hypertension does not only occur in adults, but 3-5% occurs in adolescents so early detection of hypertension is very important to reduce complications due to hypertension. Family history of hypertension and smoking habits have been proven to be a risk factor for hypertension in adolescents. This study aims to determine the relationship between family history of hypertension and smoking habits with Incidence of Hypertension Among Adolescent in Palembang.The research conducted was observation research with cross sectional study design. Using primary data which obtained from blood pressure measurements and filling out questionnaires. The sample of this study were students from 12 high schools in Palembang who met the inclusion criteria and did not meet the exclusion criteria with a total sample of 515 students. The results of the chi-square analysis showed that there was significant relationship between family history of hypertension with Incidence of Hypertension Among Adolescent (p=0,000; PR=3,299; 95% CI= 2,906-7,265). And there was no significant relationship between smoking habits with Incidence of Hypertension Among Adolescent (p=1,000; PR=0,916; 95% CI= 0,293-2,735) in Palembang.

Keywords*:* Family history of hypertension, smoking habit, hypertension, adolescent

1. INTRODUCTION

Hypertension is still a challenge for the world of health. It happens due to the high prevalence of hypertension and becomes the cause of cardiovascular disease and chronic kidney failure (Forouzanfar et al., 2015). Mills et al on 2016 researched the prevalence of hypertension in the world with samples across 90 countries from 2000 to 2010. It reported that 31,1% of adults had experienced hypertension (Mills et al., 2016). Based on WHO, 2015, about 1.13 billion people in the world had suffered from hypertension (WHO, 2016). In Indonesia specifically, based on Indonesia Base Health Research, 2013, the prevalence of hypertension peaked at the rate of 25,8% and recently had updated on 2018 with the percentage significantly increased into 34,1% (Riskesdas, 2018).

Besides the increasing prevalence over time, the variation of patient's age also widened. Incidence of hypertension among children and adolescents has been found frequently. The study conducted by Falkner et al, showed that prevalence of hypertension among children and adolescents in the world peaked at the rate of 3-5% (Falkner, 2010). On 2013, the prevalence of hypertension among adolescents in Indonesia had increased into 8,7% (Riskesdas, 2013). This phenomenon

should become the alarm to prevent the same thing in the future by avoiding the risk factors of hypertension.

There are numerous risk factors of hypertension among adolescents, the significant one is family history of hypertension (Indonesia Ministry of Health, 2014). Oftentimes, studies relatively showed that the cause of hypertension was the polymorphism of ACE gene. This polymorphism also leads angiotensine converting enzyme (ACE) and angiotensine II on someone's body which becomes the main cause of hypertension (Arifin & Saleh, 2014; Zarouk et al., 2012).

The study conducted by Singh et al on 2010 concluded that 30-60% of human blood pressure were affected by genetic factors (Singh, Mensah, & Bakris, 2010). The study conducted by Sidomulyo Public Health Center, Pekanbaru showed that 71,9% of adolescents who had suffered from hypertension had family history of hypertension (Fitriana, Lipoeto, & Triana, 2013). Another study done by Raihan, Erwin, dan Dewi also shared the similar conclusion, but this time covered by 83,3% of respondents. In opposite with the previous study, Kalangi reported that there was no connection between family history and incidence.

Smoking habits is another factor which most of time proved has a particular connection with hypertension, aside from genetics. There are 4000 chemical substances in a cigarette, while specifically nicotine and carbon monoxide are attributed with the cause of hypertension. On 2016, WHO reported that approximately 1.1 billion people across the globe was an active smoker. Based on Indonesia Base Health Research, 2007, smokers in Indonesia peaked on 34,2% and had increased into 36,3% on 2013 (Riskesdas, 2013). Among adolescents, the prevalence of smokers was 72% on 2013 and had become 9,1% on 2018. Octavian stated that there was a significant connection between smoking habits and hypertension with 77,2% of smokers had suffered from the disease. In other hand, Farabi on 2017 concluded that there was no specific connection which led smoking habits into hypertension.

Adolescence is a transition period from childhood to adulthood. In this period, a lot of changes happen such as on hormone, psychology, physic, and social (RL Batubara Jose, 2010). The study of hypertension among adolescents is still not carried out oftentimes, even ever conducted before in Palembang. In reality, if diagnosis of hypertension were conducted and controlled earlier, it would have restrained the number of complications which caused by hypertension in the future. The study of relationship between family history of hypertension on smoking habits among adolescents should be carried out considering the fact that it would be beneficial on preventing the disease.

2. METHODS

This study is an observational analytical study with cross sectional study design which was conducted July to December 2019. The samples are third year high school students across 12 high schools in Palembang who had fulfilled inclusion criteria and who had not fulfilled exclusion criteria

Samples were selected with multistage random sampling method through several steps. Firstly, 119 high schools in Palembang were divided into two groups, which are, Seberang Ilir with 83 high schools on it and Seberang Ulu with 36 high schools. Then, with a proportional allocation, 10% of number of high schools on each group were selected. After that 4 high schools were selected for Seberang Ulu and 8 high schools for the other. Next, researcher selected high schools with the largest number of students on each sub district and the data was sorted from the

largest amount. High schools with the largest number of students which are SMAN 1, SMAN 2, SMAN 3, SMA 8, SMAN 9, SMAN 13, SMAN 17, SMAN 18, SMAN 19, SMAN 22, SMA Muhammadiyah 1 dan SMA Xaverius 1 Palembang were considered as the population.

Inclusion criteria on this research were the 14 to 18-year-old adolescents who were willing to become respondents by signing the informed consent. Meanwhile, the exclusion criteria were the ones who were sick or absent on the research day, consumed drugs which affected blood pressure changes, diagnosed with congenital heart disease, consumed coffee ≤ 30 minutes prior to blood pressure measurement, and did the vigorous activity before.

Primary data on this research was obtained through blood pressure measurement by using mercury sphygmomanometer and questionnaire assessment on family history of hypertension and smoking habits, which preceded by permission of high school student's parents and explanation of the procedure.

Univariate analysis was performed by identifying frequency distribution of certain variables which are age, gender, parent's history of hypertension, family member's history of hypertension, smoking habits, and parents' smoking habits. Bivariate analysis was done by identifying the result of chi-squared test.

3. RESULTS

Data used on this research was collected on August 2019. From 12 high schools selected, the total amount of respondents participated was 515 students who had fulfilled inclusion criteria and had not fulfilled exclusion criteria.

Based on 515 samples, most of respondents were 15 years old, 174 students (33.8%) and the least were 17 years old, 87 people (16.9%). Data distribution is presented on Table 1.

Table 1. Respondent's characteristic based on age (n=515)

Age (years old)	n	Percentage (%)
14 tahun	90	17.5
15 tahun	174	33.8
16 tahun	164	31.8
17 tahun	87	16.9

Table 2 highlights that from total amount of 515 respondents sorted by gender, 326 female students (63,3%) is dominant over the male ones.

Table 2. Respondent's characteristic based on gender (n=515)

Gender	n	Percentage (%)
Male	189	36.7
Female	326	63.3

Based on 515 respondents, there are 222 students (43.1%) who have parents with history of hypertension, 130 (25.2%) students who have father with history of hypertension, 124 (24.1%) students who have mother with history of hypertension, 33 students (6.4%) who have both parents with history of hypertension, and 110 students (21.4%) who have another family member with history of hypertension. Data distribution is presented on Table 3.

Table 3. Respondent's characteristic based on parents and family with history of hypertension (n=515)

Variable (with history of hypertension)	n	Percentage (%)
Parents		
Yes	222	43.1
No	293	56.9
Father		
Yes	130	25.2
No	385	74.8
Mother		
Yes	124	24.1
No	391	75.9
Both Parents		
Yes	33	6.4
No	482	93.6
Other family member		
Yes	110	21.4
No	405	78.6

Table 4 shows data distribution of smoking habits among high school students in Palembang. Based on the data gathered from 515 respondents, there are 20 students (3.9%) who have smoking habits.

Table 4. Respondent's characteristic based on smoking habits (n=515)

Smoking habits	n	Percentage (%)
Yes	20	3.9
No	495	96.1

Tabel 5 shows characteristic of smoking on respondents. Based on data of respondents with smoking habits, type of cigarette which mostly used is filtered cigarette with total amount of 19 respondents (95%). There are more respondents who have smoke for <3 years rather than the ones who have smoke for ≥3 years with total amount of 15 respondents (75%). All of the respondents are light smokers with total amount of 20 respondents (100%).

Table 5. Smoker respondent's characteristic (n=20)

Variable	n	Percentage (%)
Type of cigarette		
Filtered	19	95
Non-Filtered	1	5
Duration of smoking		
<3 years	15	75
≥3 years	5	25
Smoking frequency		
Light	20	100
Average	-	-
Heavy	-	-

Based on collected data, there are 266 respondents (51.7%) who have smoking father, 8 respondents (1.6%) who have smoking mother and 7 respondents (1.4%) who have both parents' smoke. Data distribution is presented on Table 6.

Table 6. Respondent's characteristic based on parents' smoking habits (n=515)

Variable	n	Percentage (%)
Smoking father		
Yes	266	51,7
No	249	48,3
Smoking mother		
Yes	8	1,6
No	507	98,4
Smoking parents		
Yes	7	1,4
No	508	98,6

Table 7 indicates the connection between respondent's parent history of hypertension and incidence of hypertension among adolescents in Palembang. Out of 222 respondents, there are 80 respondents (36%) who have parents with history of hypertension and 142 respondents who have parents without history of hypertension.

The P value is 0,000 (p>0,05) which obtained through chi-squared test interpreted that statistically, there is a significant relationship between parents' history of hypertension and incidence of hypertension among adolescents in Palembang. PR value on this study is equal to 3,299 which stated that a respondent with family history of hypertension has a risk to suffer from hypertension 3,299 times higher than respondents without parents' history of hypertension.

Table 7. Relationship between family history of hypertension and incidence of hypertension among respondent

Parents' history of hypertension	Hypertension		Total	PR	p *value*	CI (95%)	
	Positive	Negative					
	n (%)	n (%)				Lower	Upper
Yes	80 (36)	142 (64)	222	3.299	0.000	2.277	4.782
No	32 (10.9)	261 (89.1)	378				

Based on Table 8, out of 130 respondents, there are 51 respondents (39.2%) who have father with hypertension and 79 respondents (60.8%) who have father without hypertension. Also, classified by 124 respondents, there are 46 respondents (37.2%) who have mother with hypertension and 78 respondents (62.9%) who have mother without hypertension. For the category of both parents, out of 33 respondents, there are 17 respondents (51.5%) who have both parents with hypertension and 16 respondents (48.5%) who have parents without hypertension. Lastly, out of 110 respondents, there are 33 respondents (30%) who have other family member with history of hypertension Based on the result of chi-square test, it can be concluded that father, mother, both parents, and other family member with hypertension have a significant connection with incidence of hypertension among adolescents in Palembang, statistically with $p<0,05$.

Table 8. Relationship between family history of hypertension and incidence of hypertension among respondent

Family history of hypertension	Hipertensi		Total	PR	p *value*	CI (95%)	
	Positive n (%)	Negative n (%)				Lower	Upper
Father	51 (39.2)	79 (60.8)	130	3.429	0.000	2.195	5.355
Mother	46 (37.1)	78 (62.9)	124	2.904	0.000	1.851	4.556
Both of parents	17 (51.5)	16 (48.5)	33	4.328	0.000	2.110	8.880
Keluarga lain	33 (30)	77 (70)	110	1.769	0.025	1.099	2.847

Table 9 shows the relationship between smoking habits and incidence of hypertension among adolescents which represented by high school students in Palembang. There are 4 respondents (4%) who has smoking habits and suffer from hypertension. After the chi-squared test conducted, it can be inferred that smoking habits, types of cigarette, duration of smoking, smoking frequency, smoking father, smoking mother, both parents are smokers cannot be justified statistically to the incidence of hypertension among students of high school in Palembang with $p>0.05$

Table 9. Relationship between smoking habits and incidence of hypertension among respondent

Smoking habits	Hypertension		Total	PR	p *value*	CI (95%)	
	Positive	Negative				Lower	Upper
	n (%)	n (%)					
Yes	4 (20)	16 (80)	20	0.916	1.000	0.376	2.237
No	108 (21.8)	387 (78.2)	495				
Cigarette types							
Filter	4 (21.1)	15 (78.9)	19	-	0.780	-	-
Non-filter	0 (0)	1 (100)	1				
Non-smoker	108 (21.8)	387 (78.2)	495				
Smoking duration							
<3 years	3 (20)	12 (80)	15	-	0.981	-	-
≥3 years	1 (20)	4 (80)	5				
Non-smoker	108 (21.8)	387 (78.2)	495				
Smoking Frequency							
Light	4 (20)	16 (80)	20	0.896	1.000	0.293	2.735
Non-smoker	108 (218)	387 (78.2)	495				
Passive smoker							
Smoking father	61 (22.9)	205 (77.1)	266	1.155	0.571	0.759	1.758
Smoking mother	2 (25)	6 (75)	8	1.203	0.687	0.239	6.044
Smoking parents	2 (28.6)	5 (72.4)	7	1.447	0.649	0.277	7.561

4. DISCUSSION

On this study, most of respondents are 15-year-old high school students with total amount of 174 students (33.8%). It is attributed to the data which released by Indonesia Basic Health Research on 2013 stated that, the prevalence of hypertension on adolescents ranging from age of 15 to 17 peaked on percentage of 5.3% (Riskesdas, 2013). This significant difference occurs due to samples used by Indonesia Basic Health Research were basically quite a lot to cover Indonesia's population as a whole.

Based on data collected from respondents, female high school students dominated gender-based category, with total number of 326 (63.3%) suffered from hypertension. In contrast to the conclusion of study conducted by Yunilasari, male respondents were dominated over the other with percentage of 53.3%. Similar result also showed by study of Agnesti, Triyanti, and Sartika with percentage of 31%. It was linked with the role of androgen hormones which increased the risk of high blood pressure higher than female (Angesti, Triyanti, & Sartika, 2018; Yunilasari, 2014).

There are 222 respondents (43.1%) who have parents with history of hypertension, 130 respondents (25.2%) who have father with history of hypertension, 124 respondents (24.1%) who have mother with history of hypertension, and 33 respondents (6,4%) who have both parents with history of hypertension. Study conducted by Angesti, Triyanti, and Sartika on 2018 shares the same result which stated that there were 26.4% of respondents who'd had parents with history of hypertension, 11.8% of respondents who'd had father and mother with history of hypertension, respectively, and 2.8% of respondents who'd had both parents with history of hypertension (Angesti et al., 2018).

Study conducted by Yunilasari stated that there were 28,4%, of adolescents who'd had parents with hypertension, 19.5% respondents who'd had father with hypertension and 15% respondents who'd had mother with hypertension, and 6.1% of respondents who'd had both parents with hypertension (Yunilasari, 2014).

Based on data collected from respondents, there are 110 respondents (21.4%) who has family history of hypertension. Study conducted on Sri Lanka showed that there were respondents who'd had other family member with history of hypertension, except father and mother, which are grandfather and siblings, in total percentage of 13.6% and 45.4%, respectively (Raihan, Erwin, & Dewi, 2014).

It is concluded that, in this study, there are 20 respondents (3.9%) who has smoking habits, while compared to the study Yunilasari, on 2014, there were only 16.6% of respondents who'd had smoking habits (Yunilasari, 2014). Meanwhile, study of Angesti, Triyanti dan Sartika showed that there were 7.6% of adolescents who'd had smoking habits (Angesti et al., 2018). On 2018, Indonesia Base Health Research also stated that prevalence of smoker ranging from age 10 to 18 peaked on the percentage og 9.1% (Riskesdas, 2018).

This study concludes that majority of respondents (95%) tend to smoke filtered cigarette, with total number of 19 respondents. The result stated differs from the conclusion of study conducted by Octavian which showed that there were greater number of respondents who had smoked non-filtered cigarette, with percentage of 88.8% (Octavian, Setyanda, Sulastri, & Lestari, 2015). The difference occurs due to the fact that this study was carried out on 2015, while nowadays, non-filtered cigarettes are less distributed compared to the filter ones.

Based on this study, there are 15 respondents (75%) who has smoked for <3 years. Jena and Purohit, on 2011, concluded that out of 111 respondents, average smoking duration was 3.84 years with standard deviation ±3,17 (Jena & Purohit, 2017).

On this study, it can be identified that all of respondents with smoking habits are considered light smokers. This result is similar to the study conducted on SMKN 1 Padang which stated that all of respondents were light smokers with percentage of 38.17% (Farabi, Afriwardi, & Revilla, 2017).

Based on data gathered from respondents, there are 266 respondents (51.7%) who has smoking father, 8 respondents (1.6%) who has smoking mother, and 7 respondents (1.4%) smoking parents. However, each of category shows less percentage compared to the result reported by Yunilasari which were 62% for respondents with smoking father, 6.1% respondents with smoking mother, and 4.2% respondents with smoking parents (Yunilasari, 2014).

This study shows the significant relationship between family history of hypertension and incidence of hypertension among high school students in Palembang with p value: 0.000 (p≤0,05) and PR equal to 3.299. It defines that someone with history of hypertension on parent(s) has 4-5 times higher risk to suffers from hypertension compared to the one without it. This result is supported by another study conducted on Sidomulyo Public Health Center, Pekanbaru which showed that 71.9% of hypertension incidence among adolescents linked to the family history of hypertension and had increased the risk into 7.67 times compared to the one without it (Fitriana et al., 2013). Study carried out by Raihan concluded that 83.3% of respondents who had suffered from hypertension, had a family history of hypertension (Raihan et al., 2014). Angesti also had conducted similar study on 2018 and had concluded that there was a significant relationship between family history of hypertension to incidence of hypertension among adolescents with p=0.003 and PR equal to 3.884 (Angesti et al., 2018). Someone who has family history of hypertension will have his/her blood pressure increased due to the family history of hypertension. It also shows a significant relationship with hypertension and puberty (Zheng et al., 2016). Previous study also showed that there were a lot of incidences found on children with history of primary hypertension compared to children without it (Wang et al., 2016).

This study concludes that there is a significant relationship on father, mother, or both parents with history of hypertension to incidence of hypertension among high school students in Palembang. Statistically, it has p value ≤0,05. It shares a similar result with study conducted by Yunilasari which stated that history of hypertension on respondents' father had showed the significant relationship with p value equal to 0.012. However, on the same study, it showed that there was no significant relationship between history of hypertension on respondent's mother and the incidence of hypertension with p value equal to 0.422. Same thing also applied on history of both parents with history of hypertension with p value equal to 0.409 (Yunilasari, 2014).

Besides father and mother, grandfather and siblings with history of hypertension also shows a significant relationship to the incidence of hypertension, proven by the study conducted on Sri Lanka. The study showed that the p value was <0.001 (Ranasinghe, Cooray, Jayawardena, & Katulanda, 2015). This result is also supported by the theory of inherited blood pressure. It is also known that blood pressure variation could be determined by genetic factors (Carretero & Oparil, 2000).

This study shows that there is no significant relationship between smoking habits, types of cigarette, smoking duration,

smoking frequency, and smoking parents linked to the incidence of hypertension among high school students in Palembang with p value >0.05. It is supported by the study conducted by Yunilasari which reported the smilar result with p value >0.05 (Yunilasari, 2014). Also, Farabi with his study on 2017, concluded that there was no relationship between smoking habits and blood pressure on respondents which were students of SMKN 1 Padang (Farabi et al., 2017). Kurniasih on her study also stated that cigarette cannot be linked to incidence of hypertension, whom result was supported by study conducted by Rachmawati on 2013 (Kurniasih I. & Setiawan M R., 2013; Rachmawati, 2013). Fitriana also concluded that there was no relationship between smoking habits and hypertension with p value equal to 0.11 on chi-squared test (Fitriana et al., 2013).

The result of this study concludes that there is no significant relationship between smoking habits and incidence of hypertension among high school students in Palembang. This might be happened due to the difference between age of respondents which ranging from age of 14-17 and the report from Indonesia Base Health Research on 2013. It reported that age when adolescents started to smoke was ranging from age of 15-19 with percentage of 55.4%. It can be inferred that there was 2 years gap between these studies' subject which probably seemed invalid to the fact that most of respondents are on their first attempt on smoking (Riskesdas, 2013). Smoking duration of respondents still considered too short in period. This is also supported by the theory stated that on suffering from hypertension, it takes 3-5 years even more. Especially, on adolescents, it the risk also seems to be lowered because of their metabolism is still on the prime condition (Unverdorben, Von Holt, & Winkelman, 2009).

5. CONCLUSION

Based on the result of study, it can be concluded that family history of hypertension has a significant relationship to the incidence of hypertension among adolescents. Also, there is no significant relationship between smoking habits and the incidence of high school students in Palembang

REFERENCES

[1]. Angesti, A. N., Triyanti, T., & Sartika, R. A. D. (2018). Riwayat Hipertensi Keluarga Sebagai Faktor Dominan Hipertensi pada Remaja Kelas XI SMA Sejahtera 1 Depok Tahun 2017. *Buletin Penelitian Kesehatan*. https://doi.org/10.22435/bpk.v46i1.41

[2]. Arifin, M., & Saleh, M. I. (2014). *Identifikasi Polimorfisme Insersi / Delesi Gen Angiotensin Converting Enzym Intron 16 Pada Pasien Preeklampsia di RS . Dr . Muhammad Hoesin Palembang*. (3), 222–228.

[3]. Carretero, O. A., & Oparil, S. (2000). Essential hypertension. Part I: Definition and etiology. *Circulation*. https://doi.org/10.1161/01.CIR.101.3.329

[4]. Falkner, B. (2010). Hypertension in children and adolescents: Epidemiology and natural history. *Pediatric Nephrology*. https://doi.org/10.1007/s00467-009-1200-3

[5]. Farabi, aulia fash, Afriwardi, & Revilla, G. (2017). Hubungan Kebiasaan Merokok dengan Tekanan Darah pada Siswa SMK N 1 Padang. *Jurnal Kesehatan Andalas*, *6*(2), 429–434. Retrieved from http://jurnal.fk.unand.ac.id

[6]. Fitriana, R., Lipoeto, N. I., & Triana, V. (2013). Faktor Resiko Kejadian Hipertensi pada Remaja di Wilayah

Kerja Puskesmas Rawat Inap Sidomulyo Kota Pekanbaru. *Jurnal Kesehatan Masyarakat*.

[7]. Forouzanfar, M. H., Alexander, L., Anderson, H. R., Bachman, V. F., Biryukov, S., Brauer, M., … Murray, C. J. (2015). Global, regional, and national comparative risk assessment of 79 behavioural, environmental and occupational, and metabolic risks or clusters of risks in 188 countries, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. *The Lancet*, *386*(10010), 2287–2323. https://doi.org/10.1016/S0140-6736(15)00128-2

[8]. Indonesia Ministry of Health. (2014). Pusdatin Hipertensi. *Infodatin*, (Hypertension), 1–7.

[9]. Jena, S., & Purohit, K. (2017). Smoking status and its effect on blood pressure: A study on medical students. *CHRISMED Journal of Health and Research*, *4*(1), 14. https://doi.org/10.4103/2348-3334.196034

[10]. Kurniasih I., & Setiawan M R. (2013). Analisis Faktor Risiko Kejadian Hipertensi di Puskesmas Srondol Semarang Periode Bulan September – Oktober 2011. *Jurnal Kedokteran Muhammadiyah Volume 1 Nomor 2 Tahun 2013*.

[11]. Mills, K. T., Bundy, J. D., Kelly, T. N., Reed, J. E., Kearney, P. M., Reynolds, K., … He, J. (2016). Global disparities of hypertension prevalence and control. *Circulation*, *134*(6), 441–450. https://doi.org/10.1161/CIRCULATIONAHA.115.018912

[12]. Octavian, Y., Setyanda, G., Sulastri, D., & Lestari, Y. (2015). Hubungan Merokok dengan Kejadian Hipertensi pada Laki-Laki Usia 35-65 Tahun di Kota Padang. In *Andalas* (Vol. 4). Retrieved from http://jurnal.

[13]. Rachmawati, Y. D. (2013). *Hubungan Antara Gaya Hidup Dengan Kejadian Hipertensi Pada Usia Dewasa Muda Di Desa Pondok*. Retrieved from http://eprints.ums.ac.id/27285/1/03._HALAMAN_DEPAN.pdf

[14]. Raihan, L. N., Erwin, & Dewi, A. P. (2014). FAKTOR-FAKTOR YANG BERHUBUNGAN DENGAN KEJADIAN HIPERTENSI PRIMER PADA MASYARAKAT DI WILAYAH KERJA PUSKESMAS RUMBAI PESISIR. *JOM PSIK*.

[15]. Ranasinghe, P., Cooray, D. N., Jayawardena, R., & Katulanda, P. (2015). The influence of family history of Hypertension on disease prevalence and associated metabolic risk factors among Sri Lankan adults. *BMC Public Health*, *15*(1), 576. https://doi.org/10.1186/s12889-015-1927-7

[16]. Riskesdas. (2013). Riset Kesehatan Dasar (RISKESDAS) 2013. *Laporan Nasional 2013*. https://doi.org/10.3406/arch.1977.1322

[17]. Riskesdas. (2018). Hasil Utama Riskesdas Tentang Prevalensi Diabetes Mellitus di Indonesia 2018. *Hasil Utama Riskesdas Tentang Prevalensi Diabetes Melitus Di Indonesia 2018*, 8. https://doi.org/1 Desember 2013

[18]. Riskesdas. (2018). *Riset Kesehatan Dasar (RISKESDAS) 2018*.

[19]. RL Batubara Jose. (2010). Adolescent Development Artikel Asli (Perkembangan Remaja). *Sari Pediatri*, *12*(1), 21–29.

[20]. Singh, M., Mensah, G. A., & Bakris, G. (2010). Pathogenesis and Clinical Physiology of Hypertension. *Cardiology Clinics*. https://doi.org/10.1016/j.ccl.2010.07.0

01
[21]. Unverdorben, M., Von Holt, K., & Winkelman, B. H. (2009). Smoking and atherosclerotic cardiovascular disease: Part II: Role of cigarette smoking in cardiovascular disease development. *Biomarkers in Medicine*, *3*(5), 617–653. https://doi.org/10.2217/bmm.09.51
[22]. Wang, G., Belgard, T. G., Mao, D., Chen, L., Berto, S., Preuss, T. M., … Konopka, G. (2016). *Epidemiology of Childhood Onset Essential Hypertension*. *88*(4), 659–666. https://doi.org/10.1016/j.neuron.2015.10.022.Correspondence
[23]. WHO. (2016). Prevalence of tobacco smoking. *WHO*. Retrieved from https://www.who.int/gho/tobacco/use/en/
[24]. Yunilasari. (2014). *Prevalens dan Faktor yang Memengaruhi Hipertensi pada Remaja Siswa SMP di Jakarta Pusat*. Retrieved from http://lib.ui.ac.id/file?file=digital/2016-4/20391215-SP-Yunilasari.pdf
[25]. Zarouk, W. A., Hussein, I. R., Esmaeil, N. N., Raslan, H. M., Reheim, H. A. A., Moguib, O., … Hamed, M. (2012). Association of angiotensin converting enzyme gene (I/D) polymorphism with hypertension and type 2 diabetes. *Bratislava Medical Journal*. https://doi.org/10.4149/BLL_2012_003
[26]. Zheng, W., Suzuki, K., Sato, M., Yokomichi, H., Shinohara, R., & Yamagata, Z. (2016). Pubertal timing and a family history of hypertension: Prospective cohort study. *Pediatrics International*, *58*(4), 284–289. https://doi.org/10.1111/ped.12821