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Analysis of Prostate Specific Antigen (PSA) level on Medical Check-up (MCU) Participants



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ABSTRACT

Background: Prostate Specific Antigen (PSA) is one of the most important biomarkers in the diagnosis, follow-up, and determining the prognosis of prostate cancer. PSA examination can be used to detect the progress of prostate cancer earlier. This research aimed to determine the distribution of PSA levels in male adults in Yogyakarta based on their age groups.

Methods: This study was a descriptive study. Data were taken from the medical records of Medical Check-Up (MCU) patients with no symptoms of prostate abnormality. The research subject was limited to adult men who undertook MCU at JIH Hospital Yogyakarta, with a total of 250 participants fulfilling the inclusion and exclusion criteria. Data were taken from 2014 to 2018. Participants' age was categorized into

age groups. The mean, median, the lowest 95%, and the highest 95% were measured descriptively in each group.

Results: The mean serum PSA level was 1.42 ± 1.31 ng/ml in the under 40-year-old group, 1.05 ± 0.42 ng/ml in the 40-49-year-old group, 2.49 ± 5.02 ng/ml in the 50-59-year-old group, 24.83 ± 122.64 ng/ml in the 60-69-year-old group, 25.54 ± 42.59 ng/ml in the 70-79-year-old group, and 7.66 ± 6.72 ng/ml in the ≥ 80 -year-old group. The level of PSA increased with age.

Conclusion: PSA levels in healthy adult men in Yogyakarta increased with age and PSA levels in Yogyakarta were higher than other populations across the world.

Keywords: Age, Medical Check-up, PSA

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INTRODUCTION

PSA is one of the most important biomarkers in the diagnosis, follow-up, and determining the prognosis of prostate cancer. The use of PSA for initial screening has reduced the incidence of diagnosing prostate cancer in the advanced stage. PSA examination can be used as an effort for men to find out the progress of prostate cancer earlier.^{1,2}

Prostate cancer is one of the main health problems in men. There are 1.6 million men diagnosed with prostate cancer every year and as many as 366,000 of them die.² In the United States of America (USA), prostate cancer is the most common malignancy and the second leading cause of death in cancer cases attacking men. The highest incidence of prostate cancer is in Western countries, while the lowest incidence is in Asia. Among Southeast Asia countries, Indonesia is considered to have the highest incidence.³

PSA is part of the human kallikrein group. It is a glycoprotein 33-kD produced by prostate epithelial cells, so it is specific for prostate organ but not for cancer since PSA also increases in benign prostate hyperplasia (BPH), inflammation (prostatitis) or post-instrumentation. PSA is metabolized by the liver with 2-3 days of half-life.⁴

In general, the occurrence of prostate cancer increases with age. Therefore, it is important to have

a regular PSA check to detect prostate cancer earlier even though there are no symptoms.⁵ The upper limit of normal PSA levels, which is 4.0 ng/ml, is not always accurate for all ages. Normal PSA levels that have been adjusted to a particular age group are better than single reference as a reference in screening.⁶ Therefore, it is necessary to conduct research to find out the normal level of PSA in each age group in a particular population so that it can be used as a reference for prostate cancer screening.

The objective of this study was to determine the distribution of PSA levels in male adults in Yogyakarta based on their age group.

MATERIAL AND METHODS

This study was a descriptive study of PSA levels in male adults based on their age. Data were taken from the MCU medical records from 2014 to 2018 in JIH Hospital Yogyakarta. The inclusion criteria were adult men aged above 19 years old with no obvious symptoms of prostate abnormality, who were examined for their PSA level. The exclusion criteria were male adults who were suspected or diagnosed with prostate cancer based on a digital rectal examination and/or a prostate biopsy. Samples were categorized into several age groups, which were < 40, 40-49, 50-59, 60-69, 70-79, and

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≥ 80 years old. The mean, median, the lowest 95%, and the highest 95% were measured descriptively.

RESULT

From the MCU examination, 250 data were obtained and included in this study. The mean serum PSA level was 1.42 ± 1.31 ng/ml in the 40-year-old group, 1.05 ± 0.42 ng/ml in the 40-49-year-old group, 2.49 ± 5.02 ng/ml in the 50-59-year-old group, 24.83 ± 122.64 ng/ml in the 60-69-year-old group, 25.54 ± 42.59 ng/ml in the 70-79-year-old group, and 7.66 ± 6.72 ng/ml in ≥ 80 year olds (Table 1). These data showed that total serum PSA levels increased with age.

DISCUSSION

The result of this study is in line with previous studies conducted in Asia that had larger sample sizes. Statistically, there was a correlation between age and total serum PSA levels, with $r = 0.559$ and $p < .05$.⁶ The average serum PSA level reached its peak at the age of 70-79 and then decreased after the age of 80. A study by Sun et al.⁷ in China with a sample of 442 healthy men revealed the same results. This study found a relatively higher upper limit on serum PSA levels than other studies conducted in Asian populations in the same age group, which were 1.91 ng/ml (<40 years), 1.19 ng/ml (40-49 years), 3.80 ng/ml (50-59 years), 69.53 ng/ml (60-69 years),

39.70 ng/ml (70-79 years), and 12.19 ng/ml (≥80 years). This is more likely to be influenced by genetic, nutritional, environmental, geographical conditions, or other unknown factors.⁵ Race, ethnicity, and lifestyle also influence the difference in PSA levels.⁶

The risk of abnormalities in the prostate, especially prostate cancer, increases with age. Routine examination of serum PSA levels in adult men plays an important role in early prostate cancer screening. However, research that has been carried out in various populations show that serum PSA levels also increase with age. In 60-year-old men without prostate cancer, serum PSA levels increased 3.2% per year or about 0.04 ng / ml.⁶ Therefore it is essential to know the normal range of serum PSA levels according to specific age groups to be used as a guide in routine examinations rather than just referring to a single value that has been agreed upon (4.0 ng / ml).

With regards to normal PSA levels according to age groups, several studies have been conducted in different populations, as shown in Table 2. A recent study conducted by Rahimifar et al.⁵ in northern Iran aimed to determine PSA levels in healthy men in different age groups and compared them with other populations. Rahimifar et al.⁵ reported that the highest range of PSA levels belonged to the age group of above 80 years old, which was 0.0-1.93 ng/ml (percentile 0-95) and the lowest range was in the under 40-year-old group. PSA levels in all age

Table 1 Serum PSA levels in healthy men in 2014-2018

Age (years)	Sample (n=250)	Mean ± SD	Median	Lowest 95%	Highest 95%
< 40	32	1.42 ± 1.31	0.96	1.01	1.91
40-49	42	1.05 ± 0.42	0.93	0.93	1.19
50-59	58	2.49 ± 5.02	1.31	1.37	3.80
60-69	62	24.83 ± 122.64	3.50	6.07	69.53
70-79	49	25.54 ± 42.59	7.27	13.87	39.70
≥ 80	7	7.66 ± 6.72	5.52	2.93	12.19

Table 2 Serum PSA levels in healthy men in different populations

Years	Population	N	PSA serum level (ng/ml)					
			< 40	40-49	50-59	60-69	70-79	≥80
2011	China ⁹	9358	1.89	2.19	2.88	4.42	6.52	-
2013	China (Beijing) ⁸	1572	-	1.565	2.920	4.113	5.561	7.285
2014	India ⁶	1253	0.71	0.85	1.13	1.45	1.84	2.35
2017	China ⁷	442	1.10 (20-29 yo), 1.20 (30-39 yo)	1.21	1.34	1.42	1.71	1.81
2018	Iran ⁵	950	0.62	0.75	0.91	1.33	1.45	1.93
2018	Indonesia (Yogyakarta)	250	1.91	1.19	3.80	69.53	39.70	12.19

groups in this study had a lower upper limit than the same age group in different populations.⁵

Sun et al. also conducted a similar study on 442 healthy men in China who were divided into 8 age groups, and reported that the mean PSA level increased with age. The peak level was at the age of 70-79 (1.39 ng/ml) but then gradually decreased.⁷ Gupta et al.⁶ also reported that PSA levels in normal males in India increased with age. It is also known that PSA levels in India are lower than other populations in the world.⁶

In Beijing, Liu et al.⁸ reported a gradual increase in PSA levels with age. They also reported that serum PSA levels had a significant correlation with age ($r = .314$, $P < .001$).⁸ In 2011, Yuan et al.⁹ also reported increased PSA levels with age. They also reported that serum PSA levels correlated with age ($P = .0001$), with an annual increase of 0.97% in the 40s, 1.58% in the 50s, 3.04% in the 60s, and 3.99% in the 70s. PSA levels correlated directly with age in Chinese men 40 years or older but not those under 40 years old. In addition, serum PSA levels of Chinese males were lower than that of White males aged 60 years or older but not lower than White males under the age of 60.⁹

CONCLUSION

PSA levels in healthy adult men in Yogyakarta increases along with age. PSA levels were higher than that of other populations across the world.

CONFLICT OF INTEREST

The authors declare that they don't have any conflict of interest regarding manuscript

ETHICAL APPROVAL

This study has been approved by the ethics committee of Faculty of Medicine, Universitas Islam Indonesia prior to study was conducted.

FUNDING

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AUTHOR'S CONTRIBUTION

Linda Rosita and Gloscindy Arma Occifa were contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

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