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The Relationship between Androgenic Alopecia and Prostate Cancer

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ABSTRACT

Prostate cancer (PC) and Androgenic Alopecia (AGA) [i] are both common diseases in elder men. It seems that androgen plays a crucial role in the growth and development of prostate cancer. Therefore, the current study intended to investigate the relationship between androgenic alopecia and prostate cancer. The present study is a case-control study conducted on 75 patients with prostate cancer (case group) referring to Imam Khomeini Hospital in Sari, Iran. The case group was compared with the control group (75 healthy individuals). The intended questionnaire of the study included information such as the age, sex, duration of disease, stage of disease, level of PSA, time diagnosis and time of interview for all the participants. The results of interview and clinical examination along with the patient's information all were filled in the questionnaire and were statistically analyzed by SPSS after data collection. The mean age of PC group and healthy group was respectively 69.08 ±8.97 and 68 .45 ±10.16 years. The average level of PSA was 10.86 ± 11.7 and 2.66 ± 2.7 ng/ml in PC and healthy group in turn. The average duration of cancer was 12.63 ±9.19 months in PC group. Furthermore, about 6.7% of cancer patients were in stage I, 48% were stage II, 29.3% were in stage III and 16% were in stage IV of prostate cancer. Besides, the number of cancer patients who had both frontal and vertex alopecia (baldness) altogether exceeded healthy individuals (P=0.002). According to the results of the present study, there was a significant relationship between prostate cancer and androgenic alopecia which might have been caused by the effect of androgens on both diseases. Consequently, androgenic alopecia can be considered as one of the risk factors associated with prostate cancer.

Keywords: Androgenic Alopecia; Prostate Cancer; Male-Pattern Hair Loss.

INTRODUCTION

Hair, as a symbol of youth, health and fertility, has an incredible effect on individual's self-confidence, interpersonal relationship and social status in terms of social communication and psychological dimensions [1]. Alopecia refers to the state of hair loss in the normal areas of hair growth especially on the scalp. In other words, alopecia is a hair loss with special pattern [2]. In order to confirm whether one has entered alopecia phase, pull test is used during which

about 20 to 40 strings of hair are hold firmly and pulled gently so that the number of plucked hairs should not exceed 6 in normal conditions. The test is replicated on both sides of the head; if more than 6 strings of hair is plucked in each test, the person has alopecia [3].

Alopecia is divided into two main types i.e. scarring alopecia, Cicatricial Alopecia, in which the hair follicle is damaged and non-scarring alopecia in which the hair follicle is normal while the hair growth is abnormal. The former, i.e. scarring alopecia, causes permanent hair loss as the result of damages to the hair follicles. Erythematous plaques may come along with or without scaly skin due to infections, autoimmune disease, sarcoidosis, trauma to the scalp or radiotherapy. Different biopsy findings in this case include lymphocytic proliferation around the hair follicle, damaged follicles, thin atrophic epidermis, and thick sclerotic dermis [4].

Male-pattern hair loss is most often an age-dependent disease and occurs most commonly along with aging to the extent that 30% and more than 50% of men suffer from hail loss respectively by the age of 30 and 50. A study has shown that almost half of the white men above 40 years have androgenic alopecia [5,6]. The incidence of AGA is important contributing to, first, psychological and social problems and second, various diseases caused by hormonal disorders or even tumor [7]. Each hair follicle enters three phases namely anagen [growth state], catagen [cessation state; a temporary and short transition stage between growth and rest] and telogen [rest state]. Hair follicle contains androgenic receptor. In the presence of androgens, genes enter anagen phase temporarily and get activated; as the result, scalp hair follicles get smaller which make the hair grow shorter and softer. Subsequently, the thinner colorless hair over the body are substituted for thicker pigmented hair. Due to the hair loss in AGA, there will be a deviation from the normal hair cycle which is theoretically reversible. Advanced AGA, however, may not respond to the treatment because the inflammation that covers the surroundings of follicle bulge may irretrievably damage the follicular stem cells [2].

That there is a relationship between male-pattern baldness and androgen has been already proven. Androgen has a crucial role in the growth and development of prostate cancer. Nevertheless, a constant direct relationship has not yet been observed between male-pattern baldness and prostate cancer. Alopecia in young men [under 30 years old] as well as hair loss on vertex area may provide a foreground for prostate cancer in the later stages of life. Prostate cancer [PC] and androgenic alopecia [AGA] both are the most common disease in elder men. The increase of androgenic receptors for the 5-alpha-reductase enzyme converts testosterone to DHT and ultimately increases hair loss. Androgen affects the development of prostate cancer by activating mutations in androgen receptor genes during the development of PC under the influence of positive rearrangement and gene expression, ligand-independent activity and mutation of androgen receptor gene [2, 8, 9].

With respect to the fact that several studies have not yet been conducted on the same subject especially in Iran and in order to better understand the relationship between AGA and PC diseases, raise the awareness of physicians and patients and better control the aforesaid diseases, particularly the prevention and control of prostate cancer, the current study intended to investigate the relationship between androgenic alopecia and prostate cancer.

MATERIALS AND METHODS

The present study is a case-control study conducted on patients with prostate cancer (case group) referring to the urology, radiotherapy and chemotherapy clinics of Imam Khomeini Hospital in 2014 in Sari, Iran. The case group was compared with the control group (healthy individuals). To this end, first, patients with prostate cancer, already diagnosed by an expert urologist and pathologist, were assigned to cased group and participated in the study. The exclusion criteria for the selected case group were a vague history of prostate cancer, benign prostatic hyperplasia disease, a history of other cancers except for prostate cancer, a history of hair loss due to other causes than androgenic alopecia. Finally, almost 75 patients with prostate cancer were assigned to the case group based on the statistical sample population. The control group included patients without PC referring to the urology, radiotherapy and chemotherapy clinics. The exclusion criteria for the selected control group were a family history of prostate cancer amongst their first-degree and second-degree relatives as well as benign prostatic hyperplasia disease. Finally, once the patients were examined in terms of age, sex and matching between case and control groups, almost 75 individuals were assigned to the control group.

The procedure and objectives of the current study was explicated to each individual after both case and control groups were selected. Once the consent and participation of the individuals were ensured, a written informed

consent was voluntarily obtained from each participant. Afterwards, the participants were interviewed and underwent clinical examination by research administrators. The collected information including the age, sex, duration of prostate cancer, stage of cancer, level of PSA, time of diagnosis, time of interview, treatment regimen and the history of PC in the family of all participants were carefully examined and their responses were filled in the questionnaire. Next, all the participants of both case and control groups were introduced to a dermatologist for clinical examination and determination of the pattern of scalp hair loss. The pattern of scalp hair loss for all the intended participants was examined based on Modified Hamilton-Norwood Scale. Furthermore, the pattern of hair loss in the ages of 30 years as well as the time of interview were recorded for both groups.

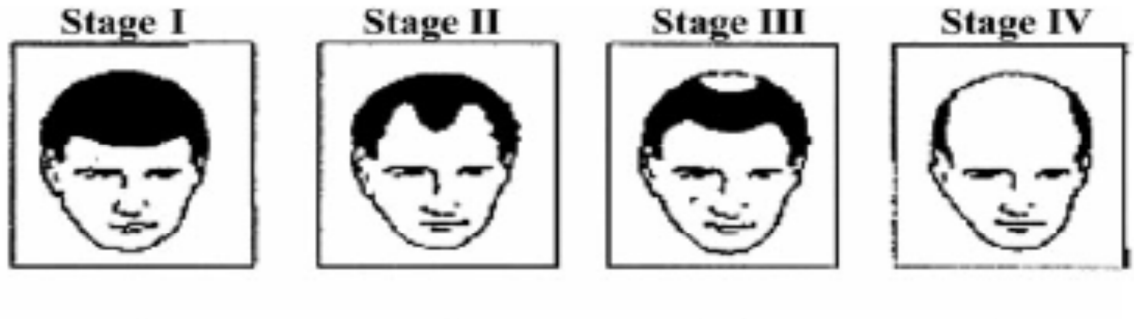


Figure 1: Modified Hamilton-Norwood Scale

Modified Hamilton-Norwood Scale
Stage I: Normal (No Baldness)
Stage II: Frontal Baldness
Stage III: Vertex Baldness
Stage IV: Frontal and Vertex Baldness

The results of the aforementioned interview and clinical examination along with the obtained information were filled in the questionnaire of each participant. After data collection, the ultimate information was filled in the statistical data sheet of the study. Once the qualitative data were codified, all the variables and responses entered SPSS (V. 18.0, III Chicago Inc.) and were statistically analyzed using descriptive statistics, t-test, chi-square, and Fisher's Exact Test.

RESULTS

Almost 150 individuals participated in the present study who were divided into two groups of 75 including patients with PC and healthy people. None of the participants had already received any treatment for alopecia. The mean age of the case (PC) and control group was respectively 69.08 ± 8.97 and 68.45 ± 9.24 years which was significant (P=0.238). The mean weight was 74.35 ± 9.24 kg in PC group and 69.48 ± 11.62 kg in healthy group which was not a significant difference (P=0.611).

The average level of PSA in PC group was 10.86 ± 11.7 ng/ml during the disease and 2.5 ± 4.9 ng/ml during the research period indicating a significant decrease. Furthermore, the average level of PSA was 2.66 ± 2.7 ng/ml in healthy group. Accordingly, there was not any significant difference between the PC and healthy groups in terms of the current level of PSA (P=0.626).

The average duration of disease was 12.63 ± 9.19 months in the case group (PC). Moreover, 5 prostate cancer patients (6.7%) were in stage I, 36 patients (48%) were stage II, 22 patients (29.3%) were in stage III and 12 patients (16%) were in stage IV of prostate cancer.

In terms of the current status of alopecia in the participants, an overall number of 23 participants (15.3%) including 5 PC patients (23%) and 18 healthy individuals (78%) had no baldness; an overall number of 64 participants (42.7%) including 29 PC patients (45%) and 35 healthy individuals (55%) had frontal baldness; an overall number of 21 participants (14%) including 12 PC patients (57%) and 9 healthy individuals (43%) had vertex baldness; and overall number of 42 participants (28%) including 29 PC patients (69%) and 13 healthy individuals (31%) had simultaneous frontal and vertical baldness. Consequently, there was a significant difference between both case and

control groups in terms of the current status of alopecia; that is, the number of prostate cancer patients who had simultaneous frontal and vertical baldness surpassed the number of healthy individuals (P=0.002).

Table 1: The Comparison between the participant groups in terms of the current status of Alopecia

Alopecia Status	Groups		Overall
	Case	Control	
No Baldness	5 (6.7%)	18 (24%)	23 (15.3%)
Frontal Baldness	24 (32%)	35 (46.7%)	59 (39.3%)
Vertex Baldness	17 (22.7%)	9 (12%)	26 (17.4%)
Frontal and Vertical Baldness	29 (38.7%)	13 (17.3%)	42 (28%)
Total	75 (100%)	75 (100%)	150 (100%)

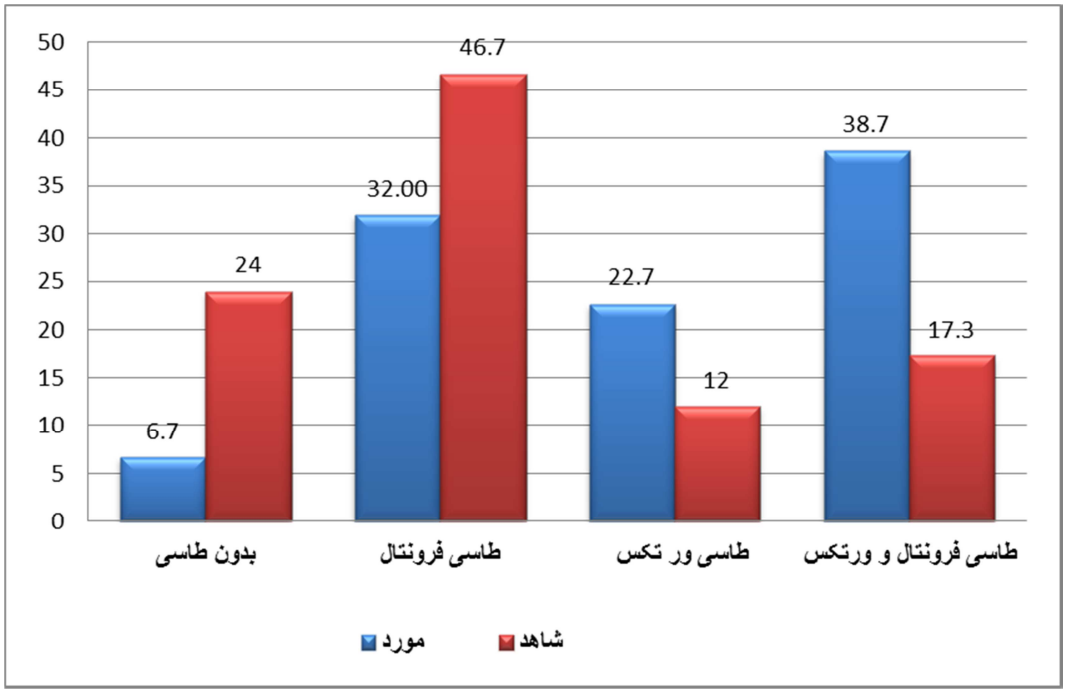
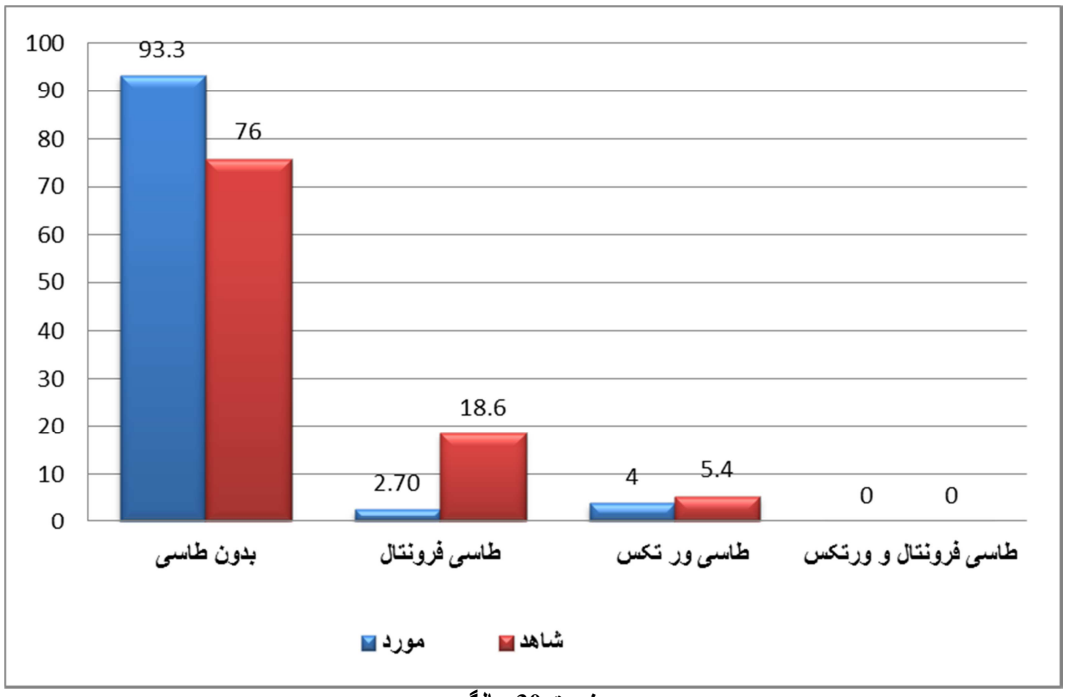


Figure 2: The frequency of participants in terms of the current status of alopecia

In terms of the previous status (history) of alopecia in the participants who were interviewed about the history of alopecia in their 30s with reference to previous photography, an overall number of 127 participants (93.3%) including 70 PC patients (55%) and 57 healthy individuals (45%) had no baldness; an overall number of 18 participants (12%) including 4 PC patients (22%) and 14 healthy individuals (78%) had frontal baldness; an overall number of 5 participants (3.3%) including 1 PC patient (20%) and 4 healthy individuals (80%) had vertex baldness. Consequently, there was a significant difference between both case and control groups in terms of the previous status of alopecia; that is, baldness was more prevalent in healthy individuals than prostate cancer patients (P=0.003).

Table 2: The Comparison between the participant groups in terms of the previous status of AGA

Alopecia Status	Groups		Overall
	Case	Control	
No Baldness	70 (93.3%)	57 (76%)	127 (84.7%)
Frontal Baldness	2 (2.7%)	14 (18.6%)	16 (10.6%)
Vertex Baldness	3 (4%)	4 (5.4%)	7 (4.7%)
Frontal and Vertical Baldness	0	0	0
Total	75 (100%)	75 (100%)	150 (100%)



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DISCUSSION

Hair loss and baldness are the most common problems of the modern society which cause many adverse effects on economic and psychological states. One of the most prevalent type of baldness is male-pattern baldness or androgenic alopecia [2]. Although hair loss and baldness can occur at any part of the body, its incidence on the scalp of the head is more stressful [1]. The present study intended to investigate the relationship between androgenic alopecia and prostate cancer in men. The mean age of the PC group was 69 years. In several credible studies, the most relative frequency of prostate cancer was reported to be at the age range of 65 to 75 years; in general, age is one of the effective risk factors on prostate cancer [10 & 11].

According to the results of the current study, a majority of PC patients were in the stage II and III of cancer. In the stage II, cancer is limited to prostate while in stage III, it was developed into the surrounding tissues such as seminal vesicle. Prostate cancer many not have any symptom in the early stages of development; thus, the best wat to diagnose PC in the early stages is clinical screening. Due to the extensive use of PSA test in the U.S., almost about 90% of the prostate cancers are diagnosed at the early stages; therefore, men will live a longer life after early diagnosis [12 & 13].

Chen et al. [2004] found that androgenic alopecia was more prevalent in patients with a prostate size larger than 30 cm^3 in compared with other patients in Taiwan [14]. In the present study, only 15% of the participants had no

baldness while 40% had frontal baldness, 27% had vertex baldness and 18% had simultaneous frontal and vertex baldness. The number of cancer patients with simultaneous frontal and vertex baldness significantly surpassed the healthy individuals.

Amoretti et al. [2013] reported that there was a significant relationship between vertex baldness and prostate cancer in America. Nevertheless, there was not any relationship between other patterns of baldness and PC. They found that vertex pattern of baldness is associated with a significant increase in the risk of prostate cancer [15].

Aria-Santiago et al. [2012] confirmed that there was a significant relationship between androgenic alopecia and prostatic hyperplasia in Spain. They also found that patients with androgenic alopecia had a considerably larger prostate size [16].

Wendy et al. [2000] found a significant relationship between early vertex baldness and prostate cancer in America [17]. On the contrary, Ruben et al. [2010] reported that there was not any significant relationship between frontal or vertex baldness and prostate cancer at any age. Furthermore, they found that simultaneous frontal and vertex baldness was associated with a significant decrease in the risk of prostate cancer. They, ultimately, concluded that there is not any significant relationship between baldness and prostate cancer [18].

Wendy et al. [1997] found that there was not any significant difference in the pattern of hair loss between PC patients and healthy individuals in America [19]. On the other hand, Wright et al. [2010] indicated that the risk of prostate cancer is less likely by 29% in patients who experience baldness at their 30s; furthermore, the risk of prostate cancer considerably decreases in patients over 60 years who have lost their hair in vertex and frontal areas [20].

Giles et al. [2002] did not observe any significant relationship between prostate cancer and frontal baldness or simultaneous frontal and vertical baldness [21]. It was found that not only the large benign prostate but also androgenic alopecia is associated with androgen involving testosterone and DHT. Moreover, the 5-alpha-reductase enzyme which converts testosterone to DHT plays a crucial role in androgens [2 & 22].

It was proposed that there may be a relationship between prostate cancer and androgenic alopecia. However, several studied confirmed while other studies rejected this assumption. It seems that race, geographical conditions and socioeconomic status have influential impact on these results. That is, in more developed countries, the diagnosis and treatment of prostate cancer is faster and PC occurs mostly in its early stages; besides, it is probable that these countries adopt a different pattern in terms of prostate cancer and even androgenic alopecia in comparison to countries like Iran. Nonetheless, the relationship between the vertical pattern of hair loss and prostate cancer is so considerable that it was also observed in the current study. It seems that further studies are required in this field. The noteworthy point of the present study is that baldness was more prevalent in healthy individuals than cancer patients at the age of 30 years. Wright et al. [2010] found that patients who experience baldness at their 30s are less exposed to the risk of prostate cancer [20]. Conversely, Ruben indicated that there is not any relationship between baldness and prostate cancer at any age [18].

In the current study, the average weight was 74 kg in prostate cancer group. Research has shown that obese men are more likely to incur precancerous changes in their prostate and they are more at the risk of prostate cancer. Overweight men are three times more exposed to the risk of developing prostate cancer. Furthermore, the risk of the development of prostate cancer into osseous tissue increases in obese men. Obese individuals are more likely at the risk of androgenic alopecia [8 & 23].

CONCLUSION

According to the results of the present study, there was a significant relationship between the risk of prostate cancer and androgenic alopecia which might been caused by the effect of androgens on these two diseases. Furthermore, like many studies, vertex baldness was more prevalent in cancer people. Therefore, vertex baldness can be considered as one of the risk factors associated with prostate cancer. However, further investigations are recommended to be conducted into this field with more precise details and greater sample size.

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[i] Male-Pattern Hair Loss (MPHL) or Male-Pattern Baldness