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Original Research Article

Verruca Vulgaris among School-Children From Semi-Rural Areas Of Eskisehir: A Community-Based Study

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Abstract: The aim of this study is to determine the prevalence of verruca vulgaris and associated factors and stress level among school children that live in semi-rural areas of Eskisehir. This cross-sectional study was conducted on high school and elementary school students from semi-rural areas of Eskisehir (Eskisehir Osmangazi University, Medical Faculty, Public Health Department Education and Research Areas) between 1 February-31 March 2016. Fitzpatrick Scale was used to evaluate the skin type. Perceived Stress Scale was used for the measurement of the stress level of students**.** The prevalence of verruca vulgaris was 4.9% (n=156) among the students. In our study, having a physician diagnosed skin disease except verruca vulgaris, having a medical history of verruca vulgaris in people who live together, having a medical history of verruca vulgaris before, having the habit of entering pool were found to be significant risk factors for verruca vulgaris (for each; $p < 0.05$). There is no relationship between skin type and frequency of verruca vulgaris ($p > 0.05$). In the study group, there is no significance in terms of stress level between who have verruca vulgaris and who have not. Verruca vulgaris is an important health issue among adolescents and children. We recommend introducing educational activities about verruca vulgaris that draw attention to its risk factors. Further studies are needed to investigate the causal link between verruca vulgaris and stress level.
Keywords: Verruca vulgaris, adolescent, stress

INTRODUCTION

Verruca is a benign skin disease caused by human papillomavirus (HPV) [1]. Verruca has four clinical forms that can be listed as follows: Verruca Vulgaris, verruca planters, verruca plana and condyloma acuminate [2]. HPV types 1, 2, 4, 27, 57 and 63 play the etiological role in verruca vulgaris which is the most common clinical form of verruca [3, 4].

Verruca vulgaris is transmitted directly from person to person and transmitted indirectly by spread through contaminated surface dust. The transfer risk of verruca vulgaris is increased by the disruption of skin integrity [5]. Walking barefoot in the swimming pool and the bathroom, frequent hand washing habits, some immunosuppression cases, having a profession that requires frequent contact with meat and fish, and living with people that have warts, are considered the common risk factors of verruca vulgaris [3, 6].

Determining the real prevalence of skin diseases is difficult. Because studies that evaluate the prevalence of skin diseases are usually conducted in health centers or restricted areas. Nonetheless, according to reports from several countries, the frequency of verruca vulgaris has been ranged from 3% to 20% [7-10]. This prevalence was reported as 2% to 11% in Turkey [11-13].

According to the 2010 Global Burden of Disease Report, cutaneous viral warts were highlighted as an important economical and public health issue [14]. For instance, Wales is spending 40 million £ annually for the diagnosis and treatment of warts [15].

Although verruca vulgaris does not present a mortality risk; it is a skin disease that has negative effects on physical and psychological wellbeing and health-related quality of life perception [15-17]. For instance, one of the adverse effects of the verruca vulgaris is increased stress level. Stress can increase

based on the region of warts and the person's age. Stress can be defined as a demand that putting people at the risk of cohesion, and exceeding available resources or environmental forces in the person-environment interaction [18]. On the other side, stress increases the dermatologic symptoms [19].

The aim of this study is to determine the prevalence of verruca vulgaris and associated factors and stress level among school children that live in semi-rural areas of Eskisehir.

MATERIAL AND METHODS

This cross-sectional study was conducted on high school and elementary school students from semi-rural areas of Eskisehir (Eskisehir Osmangazi University, Medical Faculty, Public Health Department Education and Research Areas) between 1 February-31 March 2016. In Beylikova Province, there were 586 students from 4 high schools and three elementary schools. In Alpu Province, there were 648 students from 1 high school and five elementary schools. In Sivrihisar Province, there were 2083 students from 8 high schools and three elementary schools. In Mahmudiye Province, there were 642 students from 5 high schools and three elementary schools. The study group consisted of 3162 (%79.9) students.

A questionnaire was prepared according to contemporary literature. Questionnaire included; socio-demographic characteristics (school, grade, age, settlement area, living area, number of siblings, income level, number of roommates, educational level of parents, working status of parents), factors that are possibly related with verruca vulgaris (smoking, physician-diagnosed chronic disease, physician-diagnosed allergic disease, a habit of walking barefoot, having personal slipper and towel, the number of daily hand washing, a habit of going to public bath and swimming pool, onychophagia, having a pet, history of verruca and treatment choice, roommate history of verruca) and Perceived Stress Scale.

The researchers were theoretically and practically educated by clinicians from Eskisehir Osmangazi University, Medical Faculty, Dermatology Department before the study.

The ethical permissions were received from the Eskisehir Directorate of National Education, management offices of schools and the Eskisehir Osmangazi University Ethical Committee (80558721/G-121).

The appointments were determined with management offices of schools. The research team took the verbal consent of students before the collection of data. Students who agreed to participate were given the questionnaire to complete in the presence of a member of the research team. The duration for completing the questionnaire was between 20 and 25 minutes for per subject.

After completing the questionnaire, students were examined by researchers through inspection. The students' hands, faces, and necks were inspected and recorded on the questionnaire form whether they had verruca according to literature [4]. If the students had warts at other parts of their bodies, their self-reported declaration was recorded.

The Fitzpatrick Skin Type Classification Scale is a self-report test for evaluating sun-sensitivity (reactivity) at primary sun exposure. Incipiently, the measure consisted of four categories of sun-reactive skin types for those with White skin. Type I refers to White persons with fair skin, blue or hazel eyes, and blond or red hair who always burn and never tan. A subgroup of type I consists of those who usually burn but develop a light tan (type II). Those with dark hair or brown eyes, who rarely burn and tan more than average are classified as type IV. A subgroup of type IV is those who sometimes experience a mild burn and develop a mild tan (type III). Two additional categories were added later, brown (type V) and black (type VI) [20].

Perceived Stress Scale (PSS) was used for the measurement of the stress level of students. PSS was developed by Cohen *et al*. in 1983. Baltas *et al*. conducted the validation study in Turkish setting in 1998. The questionnaire consisted of 14 questions, and the total score ranged between 0 and 56. A higher score indicates higher perceived stress level [21].

Students who smoke at least one cigarette daily were defined as smokers [22]. Students were determined as low, moderate and good income level based on students' reporting.

Statistical analysis was done with IBM SPSS Statistics software (version 20.0). The statistical analysis was carried out using Chi-square tests (x^2), Mann-Whitney U and Logistic Regression Analysis *(Stepwise Backward Wald)*. A value of $p<0.05$ was considered statistically significant.

RESULTS

In the study group, there were 1642 (%51.9) male students and 1520 (%48.1) female students. The mean age of students was 14.12±2.19 years and the ages of students ranged between 10 and 18 years. The prevalence of verruca vulgaris was 4.9% (n=156) among the students. The socio-demographic characteristics of the students with and without verruca vulgaris are summarized in Table 1.

Table 1: The socio-demographic characteristics of the students with and without verruca vulgaris

Sociodemographic	Verruca vulgaris			Statistical analyses X^2; p
	No n (%)[a]	Yes n (%)[a]	Total n (%)[b]	
Settlement area				
City center	176 (95.1)	9 (4.9)	185 (5.9)	1.418; 0.492
Town Center	1788 (94.7)	100 (5.3)	1888 (59.7)	
Village	1042 (95.7)	47 (4.3)	1089 (34.4)	
Living with				
Family	2112 (94.8)	115 (5.2)	2227 (70.4)	0.852; 0.356
Others	894 (70.3)	41 (4.4)	935 (29.6)	
School				
Elementary	1355 (94.5)	79 (5.5)	1434 (45.4)	1.853; 0.173
High	1651 (65.5)	77 (4.5)	1728 (54.6)	
Age group				
≤12	808 (94.4)	48 (5.6)	856 (27.1)	1.768; 0.622
13-14	746 (95.8)	33 (4.2)	779 (24.6)	
15-16	958 (94.9)	51 (5.1)	1009 (31.9)	
≥17	494 (95.4)	24 (4.6)	518 (16.4)	
Gender				
Male	1564 (95.2)	78 (4.8)	1642 (51.9)	0.245; 0.621
Female	1442 (94.9)	78 (5.1)	1520 (48.1)	
The number of people living with				
≤3	475 (94.6)	27 (5.4)	502 (15.9)	0.444; 0.801
4-5	1659 (95.0)	87 (5.0)	1746 (55.2)	
≥6	872 (95.4)	42 (4.6)	914 (28.9)	
The number of siblings				
0	104 (96.3)	4 (3.7)	108 (3.4)	2.978; 0.395
1-2	1592 (95.4)	77 (4.6)	1669 (52.8)	
3-4	966 (94.2)	60 (5.8)	1026 (32.4)	
≥5	344 (95.8)	15 (4.2)	359 (11.4)	
Income level				
Bad	127 (94.8)	7 (5.2)	134 (4.2)	1.400; 0.496
Moderate	1912 (95.4)	92 (4.6)	2004 (63.4)	
Good	967 (94.4)	57 (5.6)	1024 (32.4)	
Total	3006 (95.1)	156 (4.9)	3162 (100.0)	

a Percent for the row
b Percent for the column

62.9% of students' mothers had lower elementary level school education, and 86.3% were not employed. 44% of students' fathers had lower elementary level school education, and 6.7% were not employed. The distribution of parents' characteristics of students with and without verruca vulgaris summarized in Table 2.

In this study, the smoking prevalence of the students was 18.7% (n=592). Of the students, 241 (%7.6) had a physician-diagnosed chronic disease, 397 (%12.6) had physician-diagnosed allergic disease and 255 (%8.1) had physician-diagnosed dermatologic disease except verruca vulgaris.

The distribution of associated factors and habits of students with and without verruca vulgaris summarized in Table 3 and 4.

Table 2: The distribution of parents' characteristics of students with and without verruca

Characteristics of parents	Verruca vulgaris			Statistical analyses X^2; p
	No n (%)[a]	Yes n (%)[a]	Total n (%)[b]	
Mother' educational level				
Illiterate	582 (94.8)	32 (5.2)	614 (19.4)	2.224; 0.527
First school	1315 (95.6)	60 (4.4)	1375 (43.5)	
Elementary	738 (94.9)	40 (5.1)	778 (24.6)	
High school and university	371 (93.9)	24 (6.1)	395 (12.5)	
Father' educational level				
Illiterate	362 (93.5)	25 (6.5)	387 (12.2)	3.894; 0.273
First school	959 (95.4)	46 (4.6)	1005 (31.8)	
Elementary	815 (95.9)	35 (4.1)	850 (26.9)	
High school and university	870 (94.6)	50 (5.4)	920 (29.1)	
Mother' working status				
Not employed	2604 (95.5)	124 (4.5)	2728 (86.3)	**5.795; 0.016**
Employed	402 (92.6)	32 (7.4)	434 (13.7)	
Father' working status				
Not employed	204 (95.8)	9 (4.2)	213 (6.7)	0.109; 0.741
Employed	2802 (95.0)	147 (5.0)	2949 (93.3)	
Total	3006 (95.1)	156 (4.9)	3162 (100.0)	

a Percent for the row, b Percent for the column

Table 3: The distribution of associated factors of students with and without verruca vulgaris

Factors	Verruca vulgaris			Statistical analyses X^2; p
	No n (%)[a]	Yes n (%)[a]	Total n (%)[b]	
Smoking				
No	2451 (95.4)	119 (4.6)	2570 (81.3)	2.691; 0.101
Yes	555 (93.8)	37 (6.2)	592 (18.7)	
Physician diagnosed chronic disease				
No	2780 (95.2)	141 (4.8)	2921 (92.4)	0.652; 0.419
Yes	226 (93.8)	15 (6.2)	241 (7.6)	
Physician diagnosed allergic disease				
No	2634 (95.3)	131 (4.7)	2765 (87.4)	1.483; 0.223
Yes	372 (93.7)	25 (6.3)	397 (12.6)	
Physician diagnosed dermatologic disease (except verruca)				
No	2788 (95.9)	119 (4.1)	2907 (91.9)	**52.034; 0.000**
Yes	218 (85.5)	37 (14.5)	255 (8.1)	
Having a roommate with verruca				
No	2696 (96.8)	89 (3.2)	2785 (88.1)	**147.327; 0.000**
Yes	310 (82.2)	67 (17.8)	377 (11.9)	
Having a friend with verruca				
No	2008 (96.4)	75 (3.6)	2083 (65.9)	**23.126; 0.000**
Yes	998 (92.5)	81 (7.5)	1079 (34.1)	
Having a pet				
No	1199 (95.2)	60 (4.8)	1250 (39.8)	0.126; 0.723
Yes	1807 (95.0)	96 (5.0)	1903 (60.2)	
Skin type				
1	22 (95.7)	1 (4.3)	23 (0.7)	6.722; 0.151
2	627 (96.0)	26 (4.0)	653 (20.7)	
3	1240 (94.8)	68 (5.2)	1308 (41.4)	
4	899 (95.5)	42 (4.5)	941 (29.8)	
5	218 (92.0)	19 (8.0)	237 (7.5)	
History of verruca vulgaris				
No	2571 (98.8)	32 (1.2)	2603 (82.3)	**430.756; 0.000**
Yes	435 (77.8)	124 (22.2)	559 (17.7)	
Total	3006 (95.1)	156 (4.9)	3162 (100.0)	

a Percent for the row, b Percent for the column

Table 4: The distribution of associated habits of students with and without verruca vulgaris

Habits	Verruca vulgaris			Statistical analyses X^2; p
	No n (%)[a]	Yes n (%)[a]	Total n (%)[b]	
Using personal towel				
No	775 (94.2)	48 (5.8)	823 (26.0)	1.916; 0.166
Yes	2231 (95.4)	108 (4.6)	2339 (74.0)	
Using personal slipper				
No	942 (94.7)	53 (5.39	995 (31.5)	0.478; 0.489
Yes	2064 (95.2)	103 (4.8)	2167 (68.5)	
Going to public bath				
No	2359 (95.6)	108 (4.4)	2467 (78.0)	**7.393; 0.007**
Yes	647 (93.1)	48 (6.9)	695 (22.0)	
Going to swimming pool				
No	2521 (95.7)	114 (4.3)	2635 (83.3)	**12.429; 0.000**
Yes	485 (92.0)	42 (8.0)	527 (16.7)	
A habit of walking barefoot				
No	1903 (95.5)	90 (4.5)	1993 (63.0)	2.006; 0.157
Yes	1103 (94.4)	66 (5.6)	1169 (37.0)	
Number of daily handwashing				
≤3	465 (94.7)	26 (5.3)	491 (15.5)	0.568; 0.967
4-5	991 (95.4)	48 (4.6)	1039 (32.9)	
6-7	513 (94.6)	29 (5.4)	542 (17.1)	
8-9	215 (95.1)	11 (4.9)	226 (7.1)	
≥10	822 (95.1)	42 (4.9)	864 (27.3)	
Onychophagia				
No	2356 (95.4)	113 (4.6)	2469 (78.1)	3.058; 0.080
Yes	650 (93.8)	43 (6.2)	693 (21.9)	
Total	3006 (95.1)	156 (4.9)	3162(100.0)	

a Percent for the row, b Percent for the column

In the logistic regression analysis, the dependent variable was verruca vulgaris and the independent variables were the factors that were found related with having verruca vulgaris in the univariate analyses. The logistic regression model was summarized in Table 5.

Table 5: The results of logistic regression analysis (final step)

Variables	ß	SE[a]	p	OR[b]	%95 CI[c]
Mother's working status (ref: not-employed)					
Employed	0.412	0.236	0.080	1.510	0.951-2399
Physician diagnosed dermatologic disease (except verruca) (ref: no)					
Yes	0.745	0.236	0.002	2.107	1.328-3.343
Having a roommate with verruca (ref: no)					
Yes	1.217	0.199	0.000	3.378	2.287-4.989
Having a friend with verruca (ref: no)					
Yes	0.346	0.187	0.065	1.413	0.979-2.039
The history of verruca vulgaris (ref: no)					
Yes	2.812	0.211	0.000	16.649	11.008-25.179
The habit of going public bath (ref: no)					
Yes	0.153	0.217	0.481	1.165	0.762-1.782
The habit of going swim-pool (ref: no)					
Yes	0.527	0.226	0.020	1.694	1.088-2.639
Onychophagia (ref: no)					
Yes	0.036	0.210	0.865	0.965	0.639-1.456
Constant	-4.991	0.222	0.000	-	-

SE[a]: Standard error, OR[b]: Odd's ratio, CI[c]: Confidence Interval

559 (%21.3) students reported a history of verruca vulgaris. Of these students, 21.3% were not treated, 26.1% were treated with drugs, 22.5% were treated with traditional methods and 5.7% were treated with cryotherapy.

The total PSS score of students was ranged between 0 and 52. The median score of the students was 27. The median score of the students with verruca vulgaris (27.0 (0.0-52.0)) and students without verruca vulgaris (27.0 (6.0-37.0)) were similar (z=0.200; p=0.841).

DISCUSSION

Verruca vulgaris is a common infectious disease that is easily recognizable by patients and physicians [23]. In this study, the prevalence of verruca vulgaris among school children was 4.9%. According to studies conducted in several countries, the prevalence of verruca vulgaris was reported between 3% and 20% [7-10]. In Turkey, this prevalence is ranged between 2-11% [11-13]. The frequency of verruca vulgaris is varied in the studies due to different geographical characteristics, socioeconomic status, and ethnic characteristics.

Education affects the standards of hygiene and health consciousness. It is possible that, high-level educated parents apply to a health center earlier when they see any skin lesion on their children. Because of this, it is expected that children of higher educated parents had less skin disease than others [24, 25]. In this study, we found no significant relationship between verruca vulgaris and education level of parents. In a study conducted in Egypt, Kasım *et al.* reported that the frequency of verruca vulgaris was found higher among the students whose parents had lower education [26]. This study was conducted in semi-rural areas, and there was homogeneity regarding educational level of parents. We may have found different results from existing literature because of this.

It is known that disruption of skin integrity due to a dermatological disease increases the risk of other infectious diseases [27-31]. Due to this, it is expected that verruca vulgaris should be observed more frequently among students that have other dermatological disease. In this study, there was statistically significant relationship between having a dermatologic disease and verruca vulgaris. According to the logistic regression analysis, students that had dermatological disease had 2.02 times higher frequency of verruca vulgaris than students that did not have any dermatological disease. Several studies reported similar results [8, 32, 33].

Verruca vulgaris infects directly by contact and infects indirectly through dust from contaminated surfaces [5]. Therefore, verruca vulgaris is expected to be more frequent among people who live with infected people. In this study, having roommates with verruca vulgaris was found as a risk factor of verruca vulgaris (OR=3.378; p<0.05). In other studies, similar results were observed [34-36].

In this study, there was significant relationship between having an active case of verruca vulgaris and history of verruca vulgaris. According to logistic regression analysis, students that had a history of verruca vulgaris had 16.65 times higher frequency of verruca vulgaris than students that did not have any history of verruca vulgaris. In contrast, Bruggink S.C. et al. reported that there was no significant relationship between active verruca vulgaris and history of verruca vulgaris [36].

In this study, having a habit of going to swimming pools was found as a potential risk factor of verruca vulgaris (OR=1.694; p<0.05). Some studies have been reported similar findings [5, 12, 37]. Contrarily, several studies found that there was no statistically significant relationship between having a habit of going to a swimming pool and verruca vulgaris [34, 36, 38].

Stress leads to infection by reducing body resistance. It is known that the stress can be a predicting factor for HPV infection via its effects on immune modulating signal molecules (catecholamine, cytokines, glucocorticoids) [39]. In this study, we found no significant relationship between verruca vulgaris and stress level. Some studies have shown that higher stress levels are related with verruca vulgaris [40-42]. In the age group that we conducted the study on, there is a low level of responsibility and the perception of stress may not be fully established. These reasons might explain our results.

CONCLUSİON

The prevalence of verruca vulgaris was 4.9% (n=156) among the students. In our study, having a physician diagnosed skin disease except verruca vulgaris, having a medical history of verruca vulgaris in people who live together, having a medical history of verruca vulgaris before, having the habit of entering pool were found to be significant risk factors for verruca vulgaris. There is no relationship between skin type and frequency of verruca vulgaris . In the study group, there is no significance in terms of stress level between who have verruca vulgaris and who have not.

Verruca vulgaris is an important health issue among adolescents and children. We recommend introducing educational activities about verruca vulgaris that draw attention to its risk factors. Further studies are

needed to investigate the causal link between verruca vulgaris and stress level.

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