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Prevalence of palmar crease patterns and associated factors among students at University of Gondar, Northwest Ethiopia

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Abstract: Palmar creases are unique, permanent, and genetically controlled morphological variables. Recognizing palmar crease types are important for personal identification, criminal investigations, and diagnosis of congenital diseases. This study aimed to reveal the anthropological characteristics as well as contribute to the diagnosing of congenital disease of Ethiopian people. In this study, a cross-sectional study design with a multistage sampling technique were used. Chi-square test, bivariable, and multivariable multinomial logistic regression models were employed. At bivariable analysis variables with a *P*-value of ≤0.2 were selected for multivariable analysis and at multivariable analysis variables with a *P*-value of ≤0.05 were considered as statistically significant factors. Most of study participants had normal palmar crease patterns (90.8%), followed by simian crease patterns (5.0%), whereas sydney crease patterns was the least (1.92%). Being male was more likely to have simian crease and sydney crease than normal crease. Right-handed subjects were less likely to have simian crease and suwon crease than normal crease. The simian crease was more common among students whose fathers were from Gurage ethnicity than normal creases. Students who have one point of origin of the primary palmar creases were more likely to have simian crease, sydney crease, and suwon crease than normal crease. In this study, the normal type of palmar crease patterns was the most prevalent. Whereas the simian crease pattern was the commonest type among the variant palmar creases. Palmar crease patterns are affected by sex, ethnicity, handedness, and points of origin of the primary palmar crease.

Key words: Palmar crease, Dermatoglyphics, Simian crease, Multinomial, Ethiopia

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Introduction

Palmar creases are unique, genetically controlled morphological variables and surface registrations of the mobility parts of the hand [1]. It marks the site of the skin joint brought into action by the underlying bony joints [1-3]. They are important tools that have been used in the areas of personal identification, criminal investigation, as well as a medical diagnosis of several congenital diseases [4-6]. Radial longitudinal creases (I), proximal transverse creases (II), and distal transverse creases (III) [7-9] are major palmar creases [8]. Based on the relationship between the two transverse creases namely the proximal transverse crease and distal transverse crease, there are four palmar crease pattern types [7]. These are normal crease, simian crease, sydney crease,

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and suwon crease [7, 8]. Simian, sydney, and suwon creases are considered as variant types of palmar creases and are mainly associated with chromosomal abnormalities and congenital diseases [8-10]. Palmar crease patterns are genetically determined variables, which differ from population to population [5, 8, 11] and help to discover the anthropologic characteristics of a population [5-7]. Variant types of palmar crease patterns such as Simian and Sydney crease formation are greatly influenced by fetal developmental abnormalities like premature and small for gestational age infants [12]. The variant types of palmar crease patterns have been employed as a diagnostic tool for several diseases with chromosomal abnormalities and strong hereditary backgrounds [2, 8, 13, 14]. The presence of Sydney crease is indicative of certain health conditions including down's syndrome, delayed development and learning difficulties [2], Alzheimers', leukemia [13], and congenital rubella [14]. Scientific evidence suggested that palm crease patterns are closely associated with brain functions and intelligence [4, 15]. Variant types of palmar creases are also employed as predictive indices in apparently normal persons in whom cryptic damage may manifest later [2]. Thus, knowledge about the prevalence of variant crease is helpful to assess the magnitude of the population which are at risk to develop the disease of chromosomal abnormalities and congenital disease [9, 10]. The presence of these variant palmar creases patterns do not necessarily always signify abnormality in genetic property or other anthropologic characteristics as it has been observed in some normal individuals and, some were exceptionally intelligent [2]. Palmar crease patterns have significantly associated with sex [8, 9], ethnicities [11, 12, 14, 16], symmetries between two palms [4, 8], handedness [8], body sides [8] and points of origin of the primary palmar crease. Since palmar crease study is helpful in revealing the anthropologic characteristics of the populations, it is better to study in countries that have different ethnic groups like Ethiopia. Moreover, Ethiopia is the origin of mankind and a resourceful country in anthropologic data. Therefore this study can give a clue of Ethiopian palmar crease patterns based on their ethnicity for anthropological studies. Most of the studies done in this thematic area didn't consider the methodological issue including sample selection and sample size calculation but, this study takes into consideration of this issue. This study aimed in revealing the anthropological characteristics as well as contributing to the diagnosing of congenital disease of Ethiopian people.

Materials and Methods

Study area and period

An institution-based cross-sectional study was conducted from January to February 2019, at the University of Gondar, northwest Ethiopia. The University of Gondar is found in Gondar city which is located 739 km from Addis Ababa, the capital city of Ethiopia. It is one of the former universities in Ethiopia and has currently five campuses. In the 2018/2019 academic year, 41,730 students were enrolled in 56 undergraduate programs.

Population

All regular undergraduate students at the University of Gondar who were attending class in the 2018/2019 academic year were our source of population. Whereas regular undergraduate students at the University of Gondar who were enrolled in the selected departments in the 2018/2019 academic year were our study population. Students with an injury to their palms and deformed hands were excluded from the analysis.

Sample size determination and sampling procedures

Single population proportion formula using *P*-value of 50%, 95% confidence interval (CI), 5% margin of error, and 10% non-response rate were used to calculate sample size. Since the sampling technique was multi-stage sampling, design effect size two was used. Then the final sample size were 845. From the five campuses of the University of Gondar, Atse Theodros II campus and the College of Medicine and Health Science campus (CMHS) were selected by simple random sampling. Among the total of 51 batches (12 departments) of the College of Medicine and Health Science campus, 9 batches (from eight departments) were selected. From the total 54 batches (15 departments) of the Atse Theodros II campus, 10 batches (from 10 departments) were selected. Proportional allocation formula were used to adjust the sample size needed for each selected campus. Then study subjects selection interval (k) was determined by deviding the number of all students who were enrolled in selected batches to sample size. The 1st student was selected randomly and then, the other students were selected using a systematic random sampling method in every k^{th} interval until the required sample size was achieved.

Table 1. List of the variables used in the study with their measurement descriptions

Type	Variable	Measurement
Dependent variable	Palmar creases pattern	
	Normal crease pattern	The Normal crease pattern is formed when proximal transverse creases (II) and distal transverse crease (III) do not meet and no crease line transversely crosses the full palms [7, 8].
	Simian crease pattern	The Simian crease pattern is formed when proximal transverse crease (II) and distal transverse crease (III) meet to form a single crease that crosses the palm and is not accompanied by the accessory crease [8, 14].
	Sydney crease pattern	The Sydney crease pattern is formed when proximal transverse crease (II) and distal transverse crease (III) meet, accompanied by accessory distal transverse crease (III) [7, 14].
	Suwon crease pattern	The Suwon crease pattern is formed when a long distal transverse crease (III) crosses the entire palm appears to join a proximal transverse crease (II) at the radial edge and a second accessory proximal transverse creases (II) is present [7, 8, 14].
Independent variable	Sex	The sex of the individual is categorized as male and female.
	Ethnicity	Categorized as Amhara, Oromo and Gurage, and Others. Others Ethnicities include; *Tigre, Sidama, Wolayita, Somali, Benishangul, Dawor, Afar, Gedio, Gamo, Hadiya, Sheka, Siltie, and shinasha.*
	Body side or right/left palm	The bodyside was categorized as right side (right palm) and left side (left palm).
	Symmetries	Symmetries were categorized as symmetry when the same crease pattern occurs in bilateral palms and asymmetry when different crease patterns occurrences in both palms.
	Number of origin of the primary palmar crease	The number of origin of the creases pattern in the radial base. It was categorized as single radial base creases (one point of origin), double radial base creases (two points of origin), and triple radial base creases (three points of origin).
	Handedness	Handedness is the instinctive tendency to use either hand effortlessly and predominantly than the other [21]. Handedness was assessed using the user-friendly online handedness assessment tool [21] which was derived from the Edinburgh Handed Inventory formula [22].

Study variables

The dependent variable was the types of the palmar crease, which has four categories: Normal, Simian, Sydney, and Suwon creases. The normal crease pattern is formed when proximal transverse creases (II) and distal transverse crease (III) do not meet and no crease line transversely crosses the full palms [7, 8]. Where as simian, sydney, and suwon creases were considered as a variant types of creases. Simian crease pattern is so named because it resembles the usual condition of non-human simians (primates) [7, 17]. The sydney crease is so named, because it was first described in Sydney, Australia, 1968 [14, 18, 19]. In addition some writers considered suwon crease as a "cousin" of the sydney line [14] and it is so named because it was first described in 2010, Suwon, Korea [7]. The patterns of these crease type are well expressed in Table 1. The independent variables this study were sex, ethnicity, bodyside, handedness, symmetry (unilateral/bilateral occurrences of patterns), and points of origin of the primary palmar crease (Table 1).

Data collection tools and procedures

Three methods of data collection were used i.e., structured self-administered questionnaires which were used to assess the sociodemographic characteristics and handedness of students; Scanning of palms using "HP Deskjet digital scanner, 2700 model (Scanner Supplier & Manufacture in China, Guangdong, China)" which was connected to a laptop computer (Fig. 1); and observational checklist which had been filled after observing the palmar images. Students were asked to fill in all the necessary information in self-administered structured questionnaires.

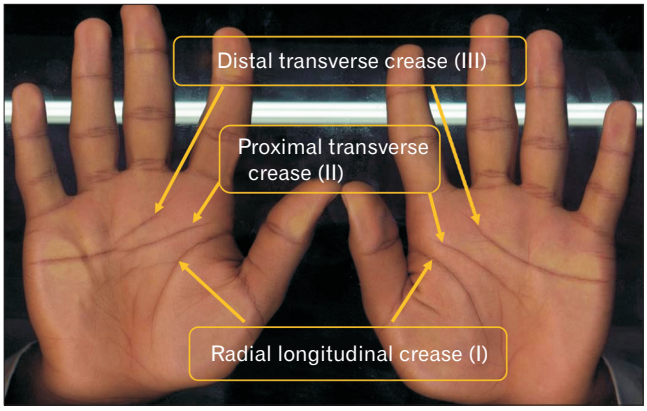

Fig. 1. Palmar scanning approaches on HP Deskjet digital scanner 2700 model.

The scanned palmar images were observed and the checklists were filled to assess palmar crease pattern, the symmetry between the two palms, and the number of radial base creases of primary palmar creases with the help of the meth-

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od presented by Park et al. [7], 2010 and Bali and Chaube [20] 1971. Handedness was assessed by asking students ten activities on which hand they perform using self-administered structured questionnaires and the answers were fed to the user-friendly online handedness assessment tool [21] which was derived from the Edinburgh Handed Inventory formula [22].

Data processing and analysis

The collected data were checked for completeness, accuracy, and clarity before analysis. Data were entered to Epi info version 7.2.2.2. (Centers for Disease Control and Prevention, Atlanta, GA, USA) and exported to Statistical Package for Social Science (SPSS) version 20 software (IBM Corp., Armonk, NY, USA) to be cleaned and analyzed. Chi-square test, bivariable and multivariable multinomial logistic regression analyses were done. The crude odds ratio (COR) were assessed and variables with *P*-value ≤0.2 were selected for the adjusted odds ratio (AOR). Associations between dependent and independent variables were declared using AORs and 95% CI with *P*-value of <0.05. The goodness of fit test and multicollinearity were checked before doing any statistical analysis and the model was good fit and no have multicollinearity between variables.

Ethical consideration

Ethical clearance was obtained from the University of Gondar's ethical review committee (no. 1415/2011). The study was conducted following the approval of the committee and after obtaining the ethical letter. To ensure confidentiality of data, study subjects were identified using codes.

Results

Sociodemographic and other characteristics of the study participants

A total of 832 students participated in this study with a response rate of 98.5%. More than two-thirds of the participants (68.4%) were males. The age range was from 17 to 35 years with a mean of 20.68±2.07 years and most of the students (70.1%) were in the age group of 20–24 years. Students from sixteen ethnic groups participated in the study and more than half (59.9%) of them were from Amhara ethnic group. The majority (87.0%) of the study subjects were right-handed.

Prevalences of palmar crease types

Most study participants (93.1%) had symmetrical palmar crease patterns. More than three-fourths (77.2%) of the total

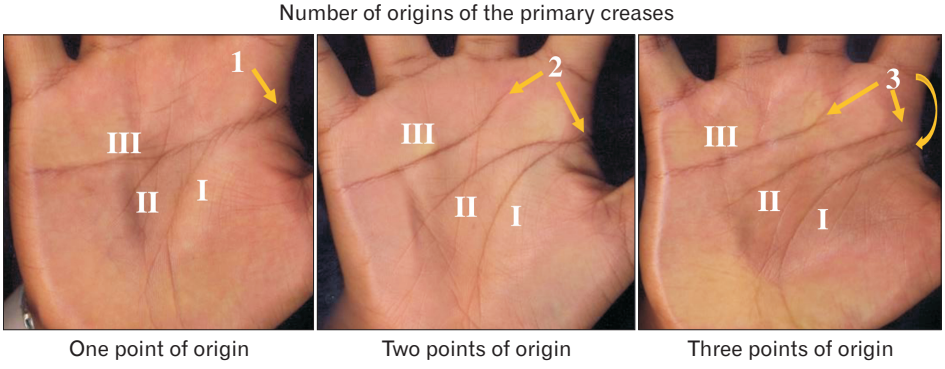

Fig. 2. Number of origins of the primary creases among students of the University of Gondar.

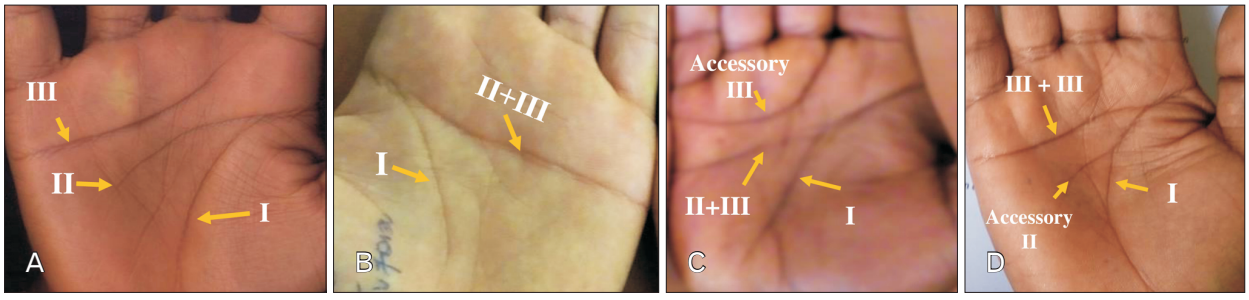

Fig. 3. Types of palmar crease patterns among students of the University of Gondar. (A) Normal, (B) Simian, (C) Sydney, and (D) Suwon.

palms were two points of origin (double radial base crease) of the primary palmar crease (Fig. 2).

Among the total of 1,664 palms normal type of palmar crease was the most common (90.8%) (95% CI: 89.5, 92.1), followed by the simian crease pattern (5.0%) (95% CI: 4.1, 5.9), whereas sydney crease was the least (1.92%) (95% CI: 1.3, 2.6) (Fig. 3, Table 1).

Bivariable and multivariable multinomial logistic regression analysis of palmar crease pattern and associated factors

From all studied explanatory variables, symmetries of palmar crease patterns and the association between crease patterns did not satisfy the assumption of the chi-square test and exclude from further analysis. The other variables such as sex, ethnicity, handedness, points of origin of the primary creases, and being right or left palm were valid on the chi-square test (Table 2).

Variables that satisfied the assumption of the chi-square test were analyzed using bivariable analysis of multinomial logistic regression. All these variables showed a *P*-value less than or equal to 0.2 at least for one of the outcome categories in the bivariable analysis and then taken to multivariable analysis. On multivariable analysis sex, ethnicity, handedness, and points of origin of the primary crease had a statistically significant association with one or more types of palmar crease patterns, and being right or left palm had no statistically significant association with variant types of palmar creases (Table 3). Being male was nearly two times more likely to have simian crease (AOR=1.80; 95% CI: 1.01, 3.22), and three times more likely to have sydney crease (AOR=2.98; 95% CI: 1.12, 7.89) than normal crease. Students from Gurage ethnic group were 3.61 times more likely to have simian crease than normal crease as compared to others (AOR=3.61; 95% CI: 1.36, 9.61); however, it had no significant association with the other types of palmar crease patterns, and also being Amhara or Oromo ethnic group had no significant association with all types of palmar crease patterns (*P*>0.05). Right-handed individuals were 67% less likely to have simian crease (AOR=0.33; 95% CI, 0.19, 0.57), and 64% less chance to have suwon crease (AOR=0.36; 95% CI, 0.18, 0.74) than normal crease as compared to left and mixed-handed.

Table 2. Cross-tabulation and chi-squaredtest of factors associated with palmar crease patterns

Explanatory variable	Palmar creases patterns			
	Normal	Simian	Sydney	Suwon
Total	1,511 (90.80)	82 (5.0)	32 (1.92)	39 (2.30)
Sex				
Male	1,019 (89.5)	64 (5.6)	27 (2.4)	28 (2.5)
Female	492 (93.5)	18 (3.4)	5 (1.0)	11 (2.1)
Ethnicity				
Amhara	921 (92.5)	50 (5.0)	11 (1.1)	14 (1.4)
Oromo	318 (91.9)	10 (2.9)	11 (3.2)	7 (2)
Gurage	79 (77.5)	11 (10.8)	4 (3.9)	8 (7.8)
Others[a]	193 (87.7)	11 (5.0)	6 (2.7)	10 (4.5)
Bodyside				
Right	756 (90.9)	43 (5.2)	16 (1.9)	17 (2.0)
Left	755 (90.7)	39 (4.7)	16 (1.9)	22 (2.6)
Number of points of origin				
One	145 (63.6)	52 (22.8)	13 (5.7)	18 (7.9)
>One	1,366 (95.1)	30 (2.1)	19 (1.3)	21 (1.5)
Handedness				
Right	1,340 (92.5)	55 (3.8)	27 (1.9)	26 (1.8)
Left and mixed	171 (79.2)	27 (12.5)	5 (2.3)	13 (6.0)
Symmetries[b]				
Asymmetry	55 (48.2)	26 (22.8)	12 (10.5)	21 (18.4)
Symmetry	728 (93.9)	28 (3.6)	10 (1.3)	9 (1.2)
Association between patterns[b]				
Normal	728 (96.3)	11 (1.5)	4 (0.5)	13 (1.7)
Simian	14 (32.6)	28 (65.1)	1 (2.3)	0 (0.0)
Sydney	6 (37.5)	0 (0.0)	10 (62.5)	0 (0.0)
Suwon	7 (41.2)	0 (0.0)	1 (5.9)	9 (52.9)

Values are presented as number (%). The numbers in the parentheses is the prevalence of the crease type. [a]Tigre, Sidama, Wolayita, Somali, Benishangul, Dawor, Afar, Gedio, Gamo, Hadiya, Sheka, Siltie, and shinasha. [b]Variables which are not valid in chi-square test assumptions.

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Table 3. Bivariable and multivariable analyses of multinomial logistic regression of factors associated with palmar creases patterns

Outcome	Explanatory variable	COR (95% CI)	AOR (95% CI)	*P*-value
Simian	Sex			
	Male	1.72 (1.01, 2.93)	1.80 (1.01, 3.22)	0.04*
	Female	1.00	1.00	-
	Ethnicity			
	Amhara	0.95 (0.49, 1.86)	1.33 (0.64, 2.78)	0.45
	Oromo	0.56 (0.23, 1.32)	0.60 (0.23, 1.53)	0.28
	Gurage	2.44 (1.02, 5.86)	3.61 (1.36, 9.61)	0.01*
	Others[a)]	1.00	1.00	-
	Handedness			
	Right	0.26 (0.16, 0.42)	0.33 (0.19, 0.57)	<0.001***
	Left and mixed	1.00	1.00	-
	Points of origin			
	One	16.33 (10.18, 26.41)	16.26 (9.89, 26.73)	<0.001***
	>One[b)]	1.00	1.00	-
	Body side			
	Right	1.10 (0.71, 1.72)	1.26 (0.77, 2.05)	0.36
	Left	1.00	1.00	-
Sydney	Sex			
	Male	2.61 (1.00, 6.81)	2.98 (1.12, 7.89)	0.02*
	Female	1.00	1.00	-
	Ethnicity			
	Amhara	0.38 (0.14, 1.05)	0.42 (0.15, 1.18)	0.10
	Oromo	1.11 (0.41, 3.06)	1.15 (0.41, 3.22)	0.78
	Gurage	1.62 (0.45, 5.93)	2.19 (0.58, 8.21)	0.24
	Others[a)]	1.00	1.00	-
	Handedness			
	Right	0.69 (0.26, 1.81)	0.96 (0.35, 2.59)	0.93
	Left and mixed	1.00	1.00	-
	Points of origin			
	One	6.45 (3.12, 13.32)	6.40 (3.05, 13.40)	<0.001***
	>One[b)]	1.00	1.00	-
	Body side			
	Right	0.9 (0.51, 2.01)	1.03 (0.51, 2.11)	0.92
	Left	1.00	1.00	-
Suwon	Sex			
	Male	1.23 (0.61, 2.49)	1.44 (0.69, 3.02)	0.33
	Female	1.00	1.00	-
	Ethnicity			
	Amhara	0.49 (0.13, 1.67)	0.77 (0.37, 1.89)	0.27
	Oromo	0.43 (0.16, 1.14)	0.46 (0.17, 1.26)	0.13
	Gurage	1.95 (0.74, 5.13)	2.50 (0.90, 6.91)	0.08
	Others[a)]	1.00	1.00	-
	Handedness			
	Right	0.26 (0.13, 0.51)	0.36 (0.18, 0.74)	0.006**
	Left and mixed	1.00	1.00	-
	Points of origin			
	One	8.16 (4.23, 15.51)	7.36 (3.74, 14.46)	<0.001***
	>One[b)]	1.00	1.00	-
	Body side			
	Right	0.71 (0.41, 147)	0.84 (0.43, 1.63)	0.60
	Left	1.00	1.00	-
Model fitness tests	LR chi squared (21)	235.52		
	Prob>chi squared	<0.001		
	Pseudo R^2	0.240		
	Deviance test	0.72		
	Pearson chi-squared test	0.24		

Normal palmar crease pattern used as a reference. The numbers in the parentheses is 95% confidence interval (CI) of the odds ratio. COR, crude odds ratio; AOR, adjusted odds ratio. [a)]Tigre, Sidama, Wolayita, Somali, Benishangul, Dawor, Afar, Gedio, Gamo, Hadiya, Sheka, Siltie, and shinasha. [b)]Two and three points of origin. *P*-value *<0.05, **<0.01, ***<0.001.

Table 4. Comparison of prevalence of palmar crease patterns with other studies in the world

Palmar crease type	Prevalence in this study	Comparison with other studies in the world		
		Similar with	Lower than	Higher than
Normal crease	90.8% (95% CI: 89.5, 92.1)		Nigeria, 93.1% [9]	Nigeria, 89% [24] Korea, 84.4% [7] India, 79.6% [8]
Simian crease[a)]	5.0% (95% CI: 4.1, 5.9)	Nigeria, 4.1% [2]	Nigeria, 8% [24] Indians, 14.4% [8]	Japanese, 4%, Swiss, 1.2% and Germans, 2.8% [2,8]
Suwon crease	2.3% (95% CI: 1.7, 3.1)	Nigeria, 2.04 % [24] India, 2.4% [8]		Korea, 0.5% [7]
Sydney crease	1.92% (95% CI: 1.3, 2.6)	Nigeria, 1.85% [9] and 1.3% [24] Korea, 2.5% [7]	Sydney Australia, 9% [19] Indian, 3.6% [8]	Nigerian, 0.19% [2]

CI, confidence interval. [a)]The detail comparisons of simian crease patterns are expressed in Fig. 4.

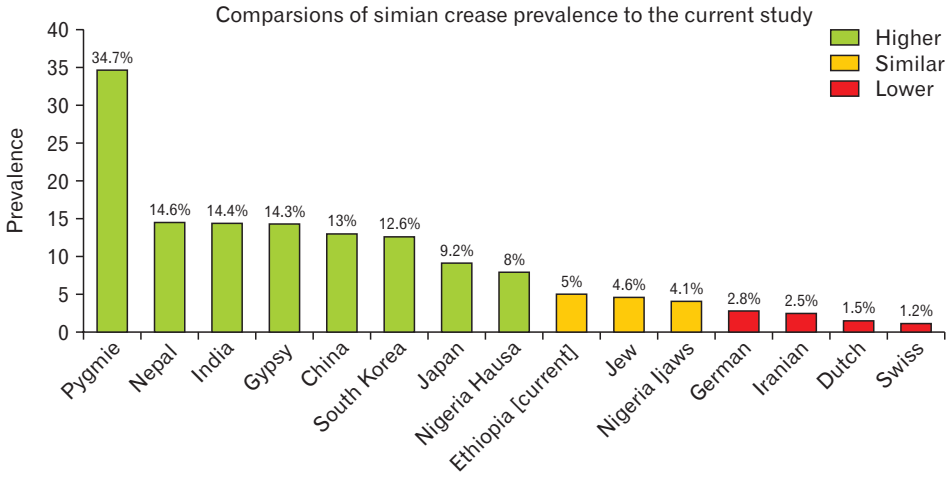

Fig. 4. Comparisons of simian crease prevalence in different parts of the world.

Students who have a single point of origin of the primary palmar crease were sixteen times more likely to have simian crease (AOR=16.26; 95% CI: 9.89, 26.73), six times more likely to have sydney crease (AOR=6.40; 95% CI: 3.05, 13.40), and seven times more likely to have suwon crease (AOR=7.36; 95% CI: 3.74, 14.46) than normal crease as compared to more than one points of origin (Table 3).

Discussion

Palm crease patterns are helpful in revealing the anthropologic characteristics of the populations [5, 12]. It also indicates the possibility of chromosomal aberrations, intrauterine toxin exposure, fetal alcoholic syndrome, mental retardation, neoplasia, and other diseases [2, 7, 12, 23]. Palmar crease patterns have practical use because they can be analyzed quickly without invasive procedures, physical pain, high costs, or age considerations [12].

In this study, the prevalence of the normal palmar crease was 90.8% (95% CI: 89.5, 92.1). It was lower than a study conducted in Nigeria (93.1%) [9] but higher than other studies conducted in Nigeria (89%) [24], Suwon, Korea (84.4%) [7], and central India (79.6%) [8] (Table 4). The difference might be due to differences in the study population, study design, and genetic differences between populations [8].

In the current study, the prevalence of the simian crease pattern was 5% (95% CI: 4.1, 5.9). It was comparatively similar to studies conducted in Nigerian (4.1%) and Jewish (4.6%) [2, 8], but lower than other studies conducted in a different part of the world [7, 8, 11, 13, 14, 24]. On the other side, the finding of this study was higher than studies conducted in Japanese (4%), Swiss (1.2%), and Germans (2.8%) [2, 8, 9] (Fig. 4). This might be associated with as palmar creases are different among races and ethnicities [25]. The prevalence of the simian crease pattern increased as we move from the Caucasians to the Orients [2]. Studies showed that palmar creases are different among ethnicities independent of their association with a given disorder [25]. This discrepancy might be explained by ethnohistoric and geographic variations between different groups of people [12], the study design used,

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and classification systems of palmar crease patterns.

The prevalence of the suwon crease pattern in this study was 2.3% (95% CI: 1.7, 3.1), which was similar to the studies conducted in Nigeria [24] and central India [8]. It was higher than a report from Suwon, Korea (Table 4) [7]. This might be due to that, the Suwon, Korean report was the first report to identify the Suwon crease pattern type and had limitations to clearly define its subtypes [7]. In this study, the sydney crease pattern was the least prevalent type (1.92%) (95% CI: 1.3, 2.6). It was comparatively similar to the two studies conducted among the Hausa ethnic group of Nigeria (1.85%) [9] and (1.3%) [24], and Suwon, Korea (2.5%) [7]. It was higher than the study conducted among the Ijaws ethnic group of Nigerian (0.19%) [2] but lower than studies conducted in Sydney Australia (9%) [19], and Central Indian (3.6%) [8] (Table 4). This difference might be explained by the ethnic variation of the Sydney crease between black and white populations [12]. Generally, the discrepancy in the prevalence of all types of palmar crease can be explained by ethnohistoric and geographic variations between different human populations [8], meanwhile, dermatoglyphic polymorphism results from the cooperation of genetic, ethnohistoric, and environmental factors [12]. Due to this, palmar crease patterns are valuable in exploring inter-ethnic variability in anthropology studies and diagnostic relevance [2, 12].

In this study, being male was nearly two times more likely to have a simian crease than a Normal crease. This was in line with a study conducted in India [8] and a study conducted among Korean and Iran populations also revealed significantly higher in males [7, 16]. A similar report was found among different studies [2, 11, 24]. In the present study, males had higher odds of sydney crease pattern than normal crease pattern. It was supported by studies conducted in Nigeria, and Korea [2, 7, 24], but on the contrary study in Central India [8]. This may be due to that later studies included a wide range of age groups [8].

In our study, students from the Gurage ethnic group were more likely to have simian crease. It is supported by another study that indicates variation in the prevalence of palmar crease across different ethnic groups [11]. This variation across different ethnic groups can be explained by genetically inherited and evidenced by parents with Simian crease having more children with this trait than offspring of parents without this [13, 20]. These differences are physical anthropological variations and normal occurrence amongst diverse human populations, but not related to chromosomal abrasion or other disease entities [2].

In this study, all variant types of the palmar crease (semian, sydney and suwon) had an association with one point of origin of the primary palmar creases. It is supported by a study conducted in the United States of America [25]. Individuals who have a single point of origin of the primary palmar crease were more likely to have Simian, Sydney and Suwon crease patterns than normal crease patterns [25].

Handedness was also another important determining factor for the occurrence of simian and suwon crease patterns in this study. Right-handed individuals were less likely to have simian crease and suwon crease patterns than normal crease patterns. In contrast to this finding, a study done in India showed that Simian crease had a statistically significant association with right-handedness, and suwon crease had no significant relation with handedness [8]. A study conducted in Nigeria also showed, no association between handedness with all types of variant crease patterns [24]. This difference might be due to different handedness assessment methods, tools and data analyzing models. In this study, the sydney crease pattern had no significant relation with handedness, which was in line with a study conducted in India [8] and Nigeria [24].

In this study, the prevalence of normal and simian crease patterns were slightly more common in right palms, however, the suwon crease was slightly more prevalent in left palms. Sydney crease had an equal distribution in both palms. But all types of palmar crease patterns hadn't statistically significant association to bodyside (P>0.05). This was supported by different studies conducted elsewhere [2, 8, 9, 16, 23].

Generally in this study, the normal palmar crease was the most prevalent. The common type among the variant palmar creases was the simian crease followed by the suwon crease and sydney crease. Palmar crease pattern is affected by different factors such as sex, ethnicity, handedness, and points of origin of the primary palmar crease. This study will be used as a baseline data for further studies of palmar crease types in all regions of Ethiopia with large sample size.

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Conflicts of Interest

No potential conflict of interest relevant to this article was reported.

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