

Prevalence of Diagonal Earlobe Crease (DELIC) in General population of Lahore and its Association with Various Ailments, as a Marker of Forensic Significance

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Abstract

Objective: To find prevalence of Diagonal Earlobe Crease (DELIC) in general population of Lahore and its association with different medical ailments

Method: It is a cross-sectional study carried out at Department of Forensic Medicine and Toxicology, Shalamar Medical and Dental College, Lahore. Convenient sampling technique was used and the participants included were the residents of different parts of Lahore city. 277 participants were studied, demographic profile was recorded on structured questionnaire and ear lobes were examined for the presence and absence of earlobe crease.

Results: The prevalence of bilateral DELIC in our study was found to be 29.6%. There were 167 males (60.3%) and 110 (39.7%) female participants in the study. The Bilateral DELIC was more prevalent in males 36% than in females which came to 20%. The male dominance of the crease was found to be statically significant ($P = 0.004$). There was significant association found between earlobe crease and with ailments like coronary artery disease, hypertension and diabetes.

Conclusion: The prevalence of the DELIC is found to be 29.6% in general population with male predominance. The DELIC showed statistically significant association with various body ailments including CAD, DM and HTN.

Keywords: Diagonal earlobe crease (DELIC), Coronary artery disease (CAD), Hypertension (HTN), Diabetes mellitus (DM), ailments, prevalence

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Introduction

The earlobe consists of robust areolar and fatty connective tissue, lacking the firmness and stretchability that the remainder of the pinna has. The earlobes are usually smooth however, sometimes exhibit creases.¹ Diagonal earlobe crease is a crease that proceeds diagonally at an angle of nearly 45° from the point of tragus

to the edge of the earlobe.² The crease within the skin of the earlobe was considered first to be linked with coronary artery disease (CAD) in 1973 by Frank and later this crease was known as Frank's sign.³ The crease manifests as a deep wrinkle, which may present either bilaterally or unilaterally, and extends backwards from the intertragic notch to the auricle.⁴ Literature reveals that the DELIC could be one of the non-invasive indicators involving the skin. This dermatological marker also correlates with the various internal diseases like coronary artery disease, cerebrovascular diseases and diseases involving peripheral vessels.⁵ Among these, coronary heart disease is the major cause of mortality globally, claiming 17.3 million lives a year worldwide.^{6,7} It is also thought to be linked with other risk factors for hypertension, hyperlipidemia, occipital baldness and with increased intima

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media.⁸ After the original work of Frank, many studies based upon the clinical, histopathological, and autopsy-based examinations revealed the association between ELC and CAD.^{9,10} Regarding forensic aspects, DELC is significantly associated with underlying CAD, and can be a strong cutaneous marker for making a prediction regarding the cause of sudden death. In forensic settings medicolegal examiners often come across with the cases of sudden death in which there is no evidence suggesting the criminal involvement. In these circumstances this dermatological marker may be included in external examination considering the underlying coronary heart disease, as it may act as corroborative evidence to comment upon the cause of sudden death. Although the DELC is considered as an important dermatological sign which may be the predictor of the various life endangering morbid conditions, a little work is there as far as subcontinent part of the world is concerned. Even in Pakistan, to best of our knowledge, little research work is there, and the papers published are handful in numbers, seeking the association of DELC with coronary atherosclerosis.¹¹ At the same time there is literature gap regarding the prevalence of DELC in general population and seeking its association with various ailments. In these circumstances it is imperative to conduct a study to determine the prevalence of DELC in general population.

Material and Methods

A cross-sectional study was carried out at Shalimar Medical and Dental College in the department of Forensic Medicine and Toxicology from 20th to 27th of September 2022. Study participants were residents of different parts of Lahore city. Adults of both genders were included and with age ranging from 20 to 70 years irrespective of socioeconomic status. Sampling was done by convenient sampling technique. All the patients with normal anatomy of earlobes without acquired ear modifications and ailments of external ears (acute and chronic) were included in the research. Patients with ear lobe alterations like surgical modifications and heavy piercings in one or both ears and those whose pinna was distorted due to some diseases were excluded. Sample size was calculated by using prevalence of DELC (25%) as obtained from a pilot study. Calculated sample size was n=277 with 95 % confidence interval.

A well-designed questionnaire as per the need of study was developed to collect and record the data of the

participants. The questionnaire was pretested and used for pilot study also. Students being supervised by senior faculty were given training by investigator with the help of power point presentation for identification, classification of DELC into mild and severe, and for the collection of data by using the questionnaire. Trained persons were also provided with the photograph of DELC to help them in explaining about the study to participants.

The informed consent was obtained from the participants of the study. The demographic profile was recorded on a structured questionnaire and participants were asked about history of three medical ailments namely CAD, DM, and HTN, ear lobes of both ears were examined for the status of ear lobe crease and the answers were recorded. The ethical approval was obtained from the institute review board.

The ear lobe creases were scored according to extent and depth and location as

1. No earlobe crease, Score 0
2. Ear lobe crease not touching both borders of ear lobes Score 1
3. Ear lobe crease touching or extending to both borders of an ear lobe and deep Score 2. Both ears will be observed in similar way.¹²

Total scoring

Absent ear lobe crease 0

Mild ear lobe crease 1-2

Severe ear lobe crease 3-4

Statistical analysis was done by using SPSS 22 software (IBM Corp, Armonk, New York, USA). Prevalence and percentages were calculated. The categorical variables were expressed in percentages and quantitative characteristics expressed as means +/- standard deviation Chi-square test was applied to find out the association between DELC and diseases, namely CAD, DM, and HTN.

Results

The prevalence of bilateral DELC in our study was found to be 29.6% (Fig-1). There were 167 males (60.3%) and 110 (39.7%) female participants in the study. The Bilateral DELC was more prevalent in males 36% than in females 20%. The male dominance of the crease was found to be statically significant. (P=0.004) Table-2. Mean age of participants was 40.02 years with standard deviation \pm 13.174. Diagonal crease was more prevalent

in older age group (49%). Table-1. The prevalence of mild and severe bilateral DELC was 89% and 11% respectively Table-3 -. The 57 patients (20.6%) had history of HTN while the history of Diabetes was present in 19.1% patients. 3.6% patients had the history of CAD respectively. Among the 10 patients having the history of CAD 70% had bilateral crease. Similarly in 57 patients presenting with the history of HTN 49% patients had bilateral ear lobe crease, while in 53 patients with dia-

betes 45% had earlobe crease respectively. Significant association was observed between bilateral DELC and DM (p=0.005), HTN (P=0.001) and CAD (P=0.004). Table-4.

Table 1: Frequency of DELC

Age Group	Frequency Of DELC	Percentage %
20 to 35	14	17
36 to 50	28	34
51 to 70	40	49
Total	82	100

Table 2: Gender distribution of diagonal earlobe crease

DELC	Sex		Total	P Value
	Female, n (%)	Male, n (%)		
Yes	22(20%)	60 (36%)	82(29.6%)	0.004
No	88(80%)	107(64%)		
Total	110(100)	167(100)		

Table 3: Grade of BDELC

Grades	Freq	%
Mild	73	89%
Severe	9	11%
Total	82	100%

BDELC= Bilateral Diagonal earlobe crease

Table 4: Association between diagonal earlobe crease and medical ailments

Association between DELC and CAD				
DELC	CAD		Total	Significance
	Yes, n (%)	No, n (%)		
Yes	7 (70)	75(28)	82(29.6)	P= 0.004
No	3(30)	192(72)	195(70.4)	
Total	10 (100)	267(100)	277(100)	
Association between DELC and DM				
DELC	DM		Total	Significance
	Yes, n (%)	No, n (%)		
Yes	24(45.3)	58(26%)	82(29.6)	P= 0.005
No	29(54.7)	166(74%)	195(70.4)	
Total	53(100)	224(100)	277(100)	
Association between DELC and HTN				
DELC	HTN		Total	Significance
	Yes, n (%)	No, n (%)		
Yes	28(49)	54(24.5)	82(29.6)	P= 0.000
No	29(51)	166(75.5)	195(70.4)	
Total	57(100)	220	277(100)	

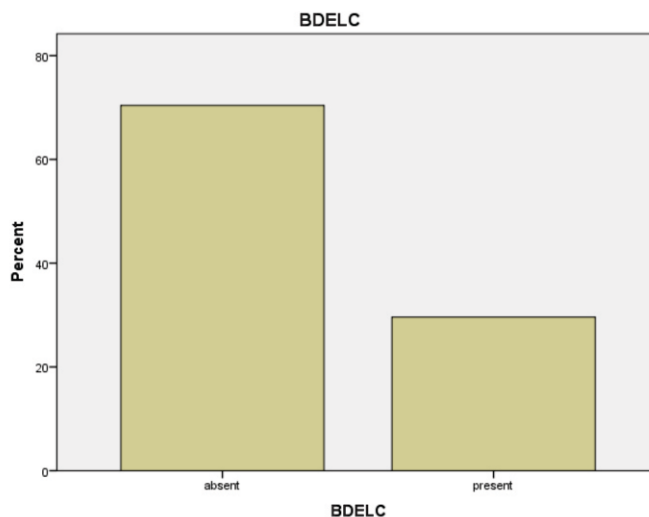


Figure 1. Prevalence of BDELC

Discussion

Diagonal ear lobe crease is thought to be a cutaneous marker of generalized atherosclerosis. It has been stated already that both earlobes and heart are supplied by “end arteries” and the chances for development of collateral circulation are minimum. Significant research work involving the histopathology from earlobe in cases of DELC have revealed some characteristic premature variations, like degeneration of elastin, atrophic elastic fibers, and the thickening of anterior artery wall.¹³ The presence of diagonal ear lobe crease as a noninvasive marker is an important marker that could result in increase in pretest probability.¹⁴ Most of the studies conducted in clinical settings or on findings on angiogram and postmortem study reports suggest that DELC may be associated with CAD and can be used as a valuable sign which can be identified easily clinically.^{15,16}

A meta-analysis from literature review revealed around 5 times increased likelihood of having CAD in the presence of DELC (OR 4.61 P<0.00001) and the association between these categorical variables was independent of different conventional cardiovascular risk factors including the age. In this regard, it can be conceived that DELC may be an important risk marker for CAD.¹⁷

Majority of the studies determining the “prevalence” of DELC was conducted in hospital settings while our study is a community-based study. The prevalence of

DELC is found to be 29.6% in our study which is higher than a study conducted in India showed the prevalence of 2.7%.¹² The prevalence of DELC was found to be significantly higher in males. This finding of male preponderance matches with the other studies though the studies were hospital based.¹⁵ It was observed that prevalence of DELC was mainly present in the older age and similar findings were noted by other investigators.^{12,19} Another theory regarding the pathophysiology of atherosclerosis is telomeres shortening during a period when somatic cells undergo replication. This attrition in the length of telomere represents the progression in the biological age. Telomere length in addition to the oxidative stress and inflammatory processes involving the circulatory system of an individual during his life has been reported to be a useful marker of biological aging of the cardiovascular system. A study carried out in Japan on Japanese population with metabolic syndromes revealed that DELC was associated with telomere shortening, which is an indicator for accelerated aging and associated atherosclerosis.¹⁸

It has already been discussed that this cutaneous noninvasive marker is significantly associated with coronary artery disease which is a leading cause of sudden death. The death which occurs without any preceding symptoms is regarded as sudden death and from medico-legal perspectives it provokes the suspicion of foul play. So in these situation this cutaneous sign might be helpful while framing opinion regarding the cause of death.²⁰

DELC was also observed to be significantly associated with DM, HTN and CAD in our study. DM and HTN are independent risk factors for CAD, and patients with DM and HTN are vulnerable to atherosclerosis. This fact may explain a significant association between DELC, DM, and HTN. These findings are in accordance with the study conducted and are in contrast with other studies.²¹

Keeping in view all the discussion, it is suggested that as there is close association between diagonal ear lobe crease (DELC) and CAD which in turn is the leading cause of the death worldwide, this cutaneous marker may be of forensic concern as forensic experts often come across with the cases of sudden deaths occurring in suspicious circumstances. In these scenarios the ear lobes can be examined for the presence or absence of ear lobe crease and emphasis should be given to complete and meticulous dissection of heart and related vessel including histopathological findings. But still, it requires further research work on larger samples and while

conducting autopsies on the victims of sudden death the ear lobe examination may be included as a part of external examination.

Conclusion

The prevalence of the DELC is found to be 29.6% in general population with male predominance. The DELC showed statistically significant association with various body ailments including CAD, DM and HTN.

Conflicts of interest

None

Funding Source

None

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Authors Contribution

MZB, MKB: Conceptualization of Project
SM, FA, AF, SA: Data Collection
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MKB, SA: Statistical Analysis
MKB, SM: Drafting, Revision
MKB: Writing of Manuscript