Comparison in age of fusion between maesosternum with manubrium sterni and xiphisternum in both the genders based on built and food habits.

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Abstract: *Objectives***: There is paucity of data on age determination from sternum in middle and elderly age groups. In all such cases, while estimating age in middle and elderly age group the forensic experts are facing lot of problem because there are few bones which ossify during this age group and the age calculated gives a bigger range and this study is done with the aim to find out age estimation within short range above thirty years age bracket. This article documents comparison in age of fusion between mesosternum with manubrium sterni and xiphisternum in both the genders based on built and food habits. *Methods:* Sterna were removed from the cadavers by sectioning the costal cartilages just besides the costo-chondral junction. *Results:* Out of total hundred sternum studied, seventy were males and thirty were females. In present study, out of the total one hundred samples of sternum retrieved from dead bodies maximum number of cases (22%) were of moderately built in > 60 years age bracket. On statistical analysis fisher's test value is 5.00 and p- value is 0.550. Maximum number of cases belonged to moderately built in both males and females. On statistical analysis chi square value is 0.760 and p- value is 0.498. None of the studies assessed had studied built of cases while determining age from sternum. Out of the total one hundred sternum samples retrieved from dead bodies 8 (8%) belonged to individuals who are non-vegetarians (19%) in 51-60 years age bracket. On statistical analysis chi- square value is 0.754 and p- value is 0.862. On comparison of male and female maximum number of them are non-vegetarians. On statistical analysis chi- square value is 0.670 and p- value is 0.498. *Conclusion:* Majority of sternum samples retrieved from dead bodies of individuals brought for postmortem belonged to 51-60 years age group in males and 30-40 years age group in females. Males (70%) outnumbered the females (30%) in this study. Majority of sternum samples belonged to individual who were moderately built and had non-veg food habits.**

Key words: sternum, xiphisternum, manubrium sterni, mesosternum, built, food habits

Introduction: The estimation of age is an integral part of the biological profile employed by forensic anthropologists in order to assist in achieving an identification of an unknown deceased individual. The biological profile consists of sex, age, ancestry, and stature estimations, which can be compared to missing persons reports.[1] Aging in the forensic context is necessary both for the dead and the living. For the dead it is principally to aid identification in creating a biological profile which can then be compared to missing persons. For the living the aim is to solve judicial or civil problems concerning age of minors as regards questions of adoption, imputability, pedopornography and for adults, civil issues on pensionable age and other similar matters for individuals lacking valid identification documents. It should always be borne in mind that, whatever the case is, all a forensic anthropologist or odontologist can do is give the best estimate of biological age regardless of how far it may be from actual chronological age, provided these limits are made clear to judicial authorities.[2] Human identification in postmortem scenarios is fundamental and achieving it is one of the most challenging task.[3] There is paucity of data on age determination from sternum in middle and elderly age groups. In all such cases, while estimating age in middle and elderly age group the forensic experts are facing lot of problem because there are few bones which ossify during this age group and the age calculated gives a bigger range and this study is done with the aim to find out age estimation within short range above thirty years age bracket. The present study is therefore an attempt to assess the age of an individual from the least studied and reliable skeletal remain, the sternum, which is one of the superficial bones, and is spared even in a highly decomposed body. Moreover, it is a bone, which can be easily procured from cadavers, without the slightest damage during routine autopsy procedure. So, considering these factors, study of the sternum is selected as an identifying unit of age. As fusion activities of bones depend upon built, food habits and heredity etc. these parameters with any relation of fusion of sternum with built and food habits were studied.

Materials and Methods:
The present study was carried using sternal bones removed during autopsy on a total of 100 cases above the age of 30 years at the Department of Forensic Medicine, Lady Hardinge Medical College, New Delhi. Sterna were removed from the cadavers by sectioning the costal cartilages just besides the costo-chondral junction. The elements of each sternum - manubrium, body and

xiphoid process were examined for their fusion. Comparison in age of fusion between mesosternum with manubrium sterni and xiphisternum in both the genders based on built and food habits was done.

Observations and results

Age distribution Out of a total of one hundred samples of sternum retrieved from dead bodies, 11 males (15.7%) and females (36.6%) belonged to 30-40 years age bracket and 21(30%) males and 1(3.3%) female in 41-50 years. 20 (28.5%) male and 7 (23.3%) female sternum samples were in 51-60 age groups whereas 18 (25.7%) males and 11 (36.6%) females belonged to >60 years age group. On statistical analysis fisher's test value is 12.99 and p- value is 0.004. Distribution of sternum samples according to age groups is shown in Table 1 and Fig. no. 1 & 2 and Fig. no. 3 is showing gender variations in samples of sternum in different age groups.

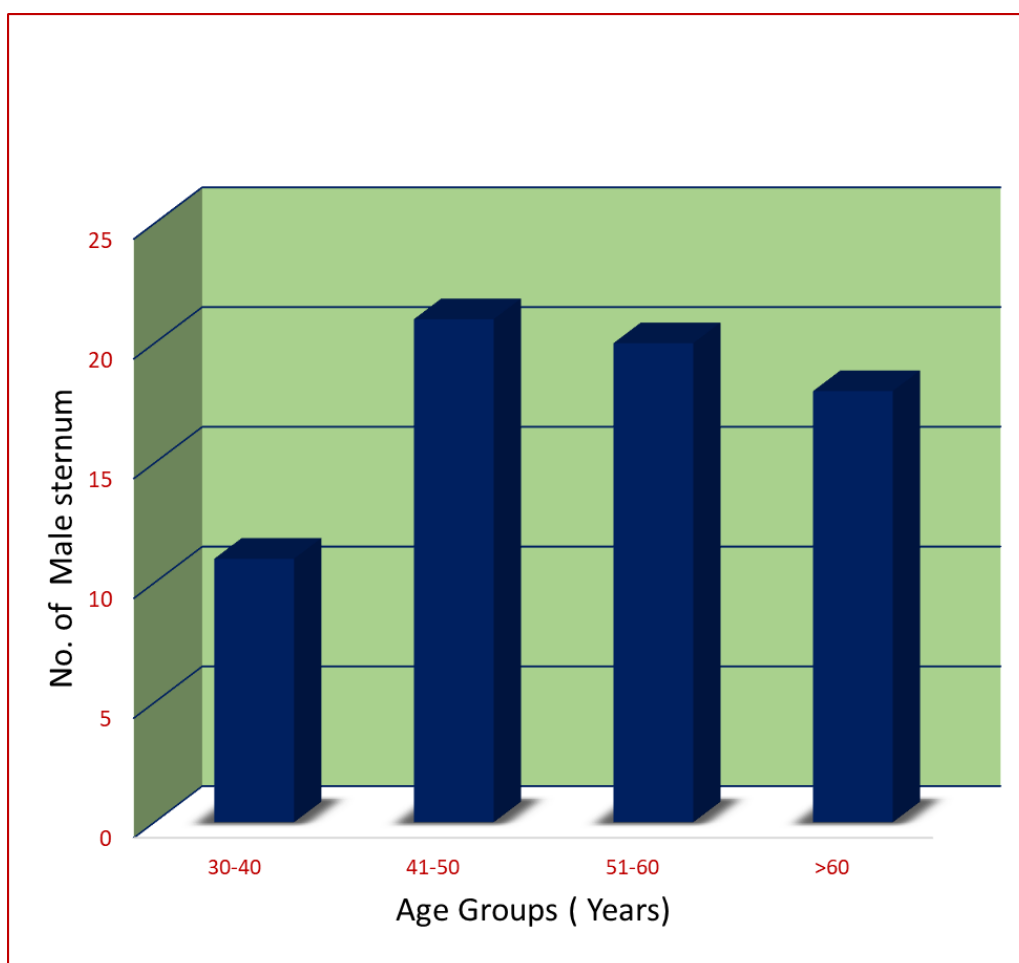| Table 1: Age Distribution of sternum samples				
Variable	*Age groups (Years)*			
	30-40	**41-50**	**51-60**	**>60**
Male	11 (15.7%)	21 (30%)	20 (28.5%)	18 (25.7%)
Female	11 (36.6%)	1 (3.3%)	7 (23.3%)	11 (36.6%)

Fig. No. 1: age distribution of total number of male sternum samples
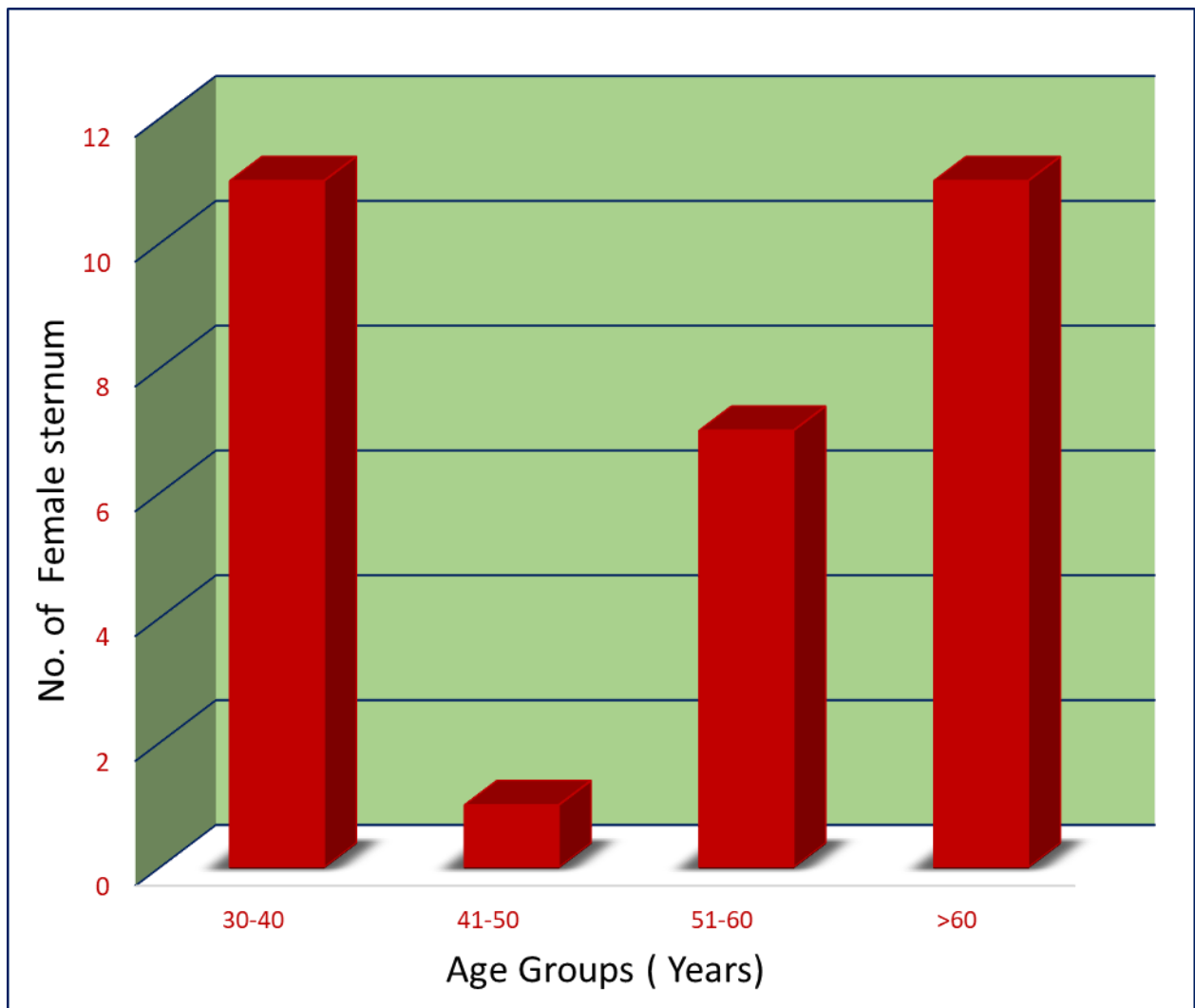
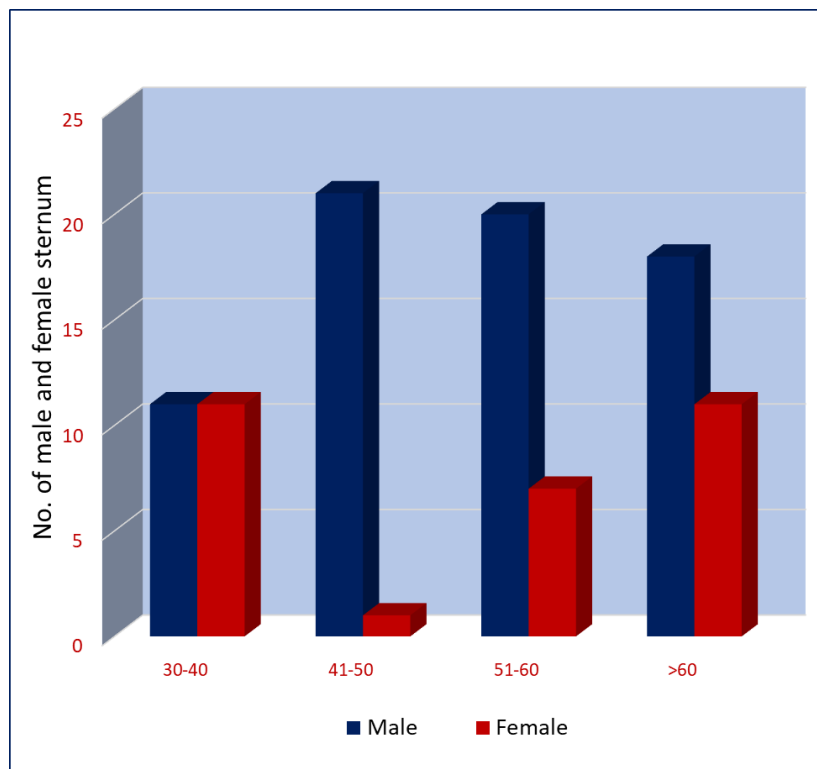**Fig. No. 2: age distribution of total number of female sternum samples**

Fig. No. 3: age distribution of total number of male and female sternum samples

Distribution of cases on the basis of built

Out of the total one hundred samples of sternum retrieved from dead bodies 2 (2%) were of individuals who were thin built, 16 (16%) of moderate built, and 4 (4%) of obese persons in 30-40 years age group; 1(1%) of thin built, 19 (19%) moderate and 2 (2%) of obese persons' in 41-50 years whereas 5 (5%) are of thin built, 16 (16%) of moderate and 6 (6%) of obese person' in age group 51-60 years whereas 2 (2%) belonged to thinly built samples, 22 (22%) are moderate and 5 (5%) of obese in age group >60 years. On statistical analysis fisher's test value is 5.00 and p- value is 0.550. Distribution of total number of cases according to their built is shown in Table 2 and Fig. no. 4.

Table 2: Distribution of sternum samples on the basis of built				
Variable	*Age groups (Years)*			
Built	**30-40**	**41-50**	**51-60**	**>60**
Thin	2 (2%)	1 (1%)	5 (5%)	2 (2%)
Moderate	16 (16%)	19 (19%)	16 (16%)	22 (22%)
Obese	4 (4%)	2 (2%)	6 (6%)	5 (5%)

Distribution of sternum samples on the basis of built

Of one hundred sternum samples retrieved from dead bodies 7 (10%) belonged to males who are thinly built, 51 (72.8%) of moderate built and 12 (17.1%) of obese; 3 (10%) belonged to females who were thin built, 22 (73.3%) of moderate built and 5 (16.6%) of obese. On statistical analysis chi square value is 0.760 and p- value is 0.498. Distribution of males and females on the basis of built is shown in Table no. 3 and Fig. no. 5.

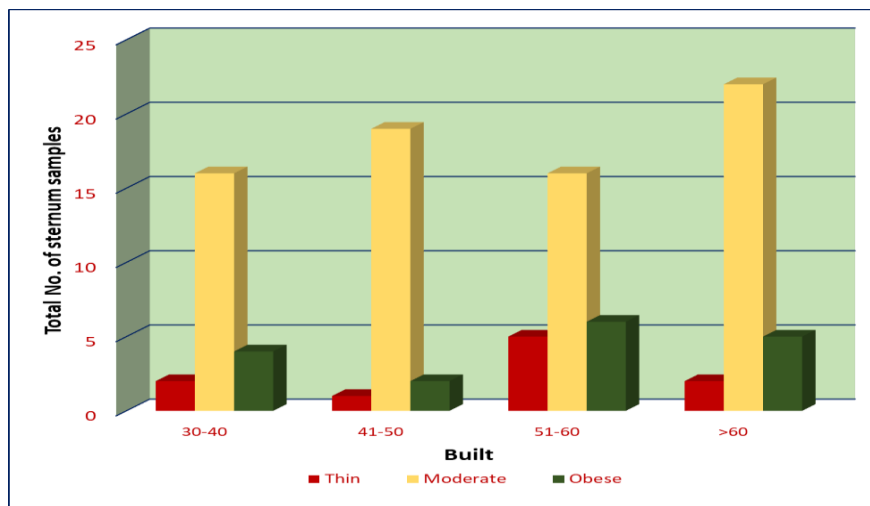| Table 3: Distribution of sternum samples on the basis of built		
Built	**Male**	**Female**
Thin	7 (10%)	3 (10%)
Moderate	51 (72.8%)	22 (73.3%)
Obese	12 (17.1%)	5 (16.6%)

Fig. No. 4- distribution of sternum samples on the basis of built

Distribution of sternum samples on the basis of food habits

Out of the total one hundred sternum samples retrieved from dead bodies 8 (8%) belonged to individuals who are vegetarians and 14 (14%) to non- vegetarians in 30-40 years age group; 9 (9%) belonged to vegetarians and 13 (13%) to non- vegetarians in 41-50 years age group and 8 (8%) belonged to vegetarians and 19 (19%) to non- vegetarians in age group between 51-60 years whereas 11 (11%) belonged to vegetarians and 18 (18%) to non- vegetarians in age group > 60 years. On statistical analysis chi- square value is 0.754 and p- value is 0.862. Distribution of total number of cases according to their food habits is shown in Table no. 4 and Fig. no. 6.

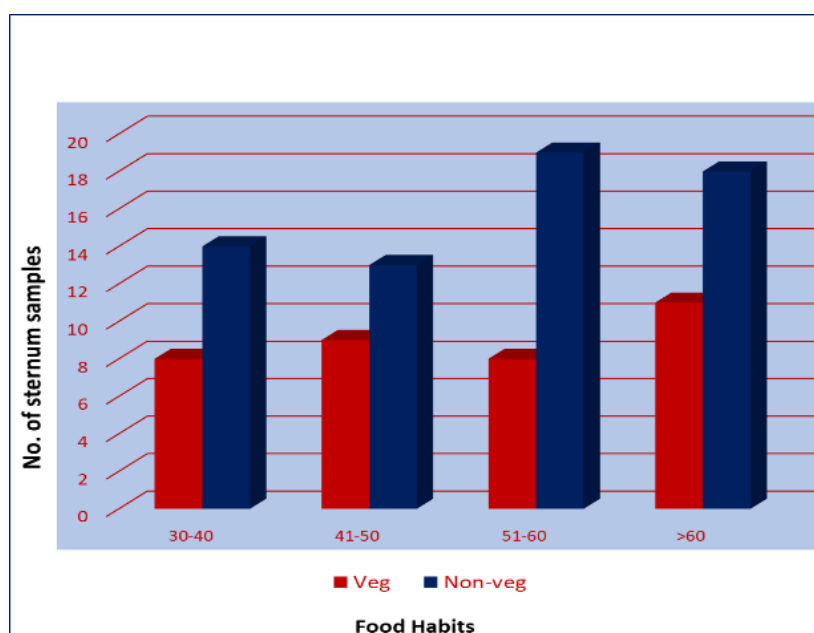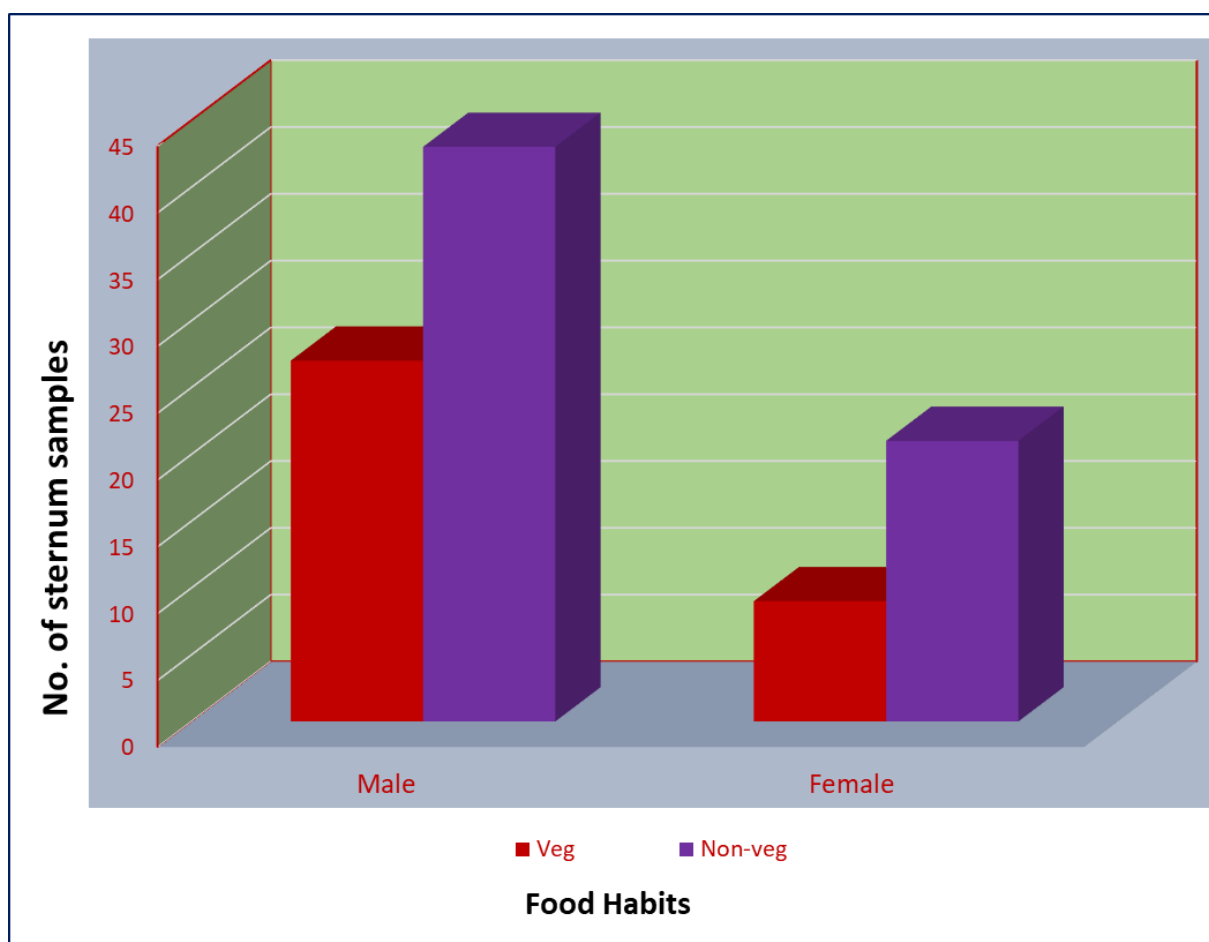| Table 4: Distribution of sternum samples on the basis of food habits			
Age groups (Years)			
Food habits			
30-40	41-50	51-60	>60
Veg 8 (8%)	9 (9%)	8 (8%)	11 (11%)
Non-veg 14 (14%)	13 (13%)	19 (19%)	18 (18%)

Fig. No. 6: distribution of sternum samples on the basis of food habits

Distribution of sternum samples on the basis of food habits

Out of the total one hundred samples of sternum retrieved from dead bodies 27 (38.5%) belonged to males who were vegetarians, 43 (61.4%) to non- vegetarians. 9 (30%) belonged to females who are vegetarians and, 21 (70%) to non- vegetarians. On statistical analysis chi- square value is 0.670 and p- value is 0.498. This distribution of sternum samples on the basis of food habits of individuals from whom they were retrieved is shown in Table no. 5 and Fig. no. 7.

Table 5: Distribution of sternum samples on the basis of food habits		
	Male	**Female**
Veg	27 (38.5%)	9 (30%)
Non- veg	43 (61.4%)	21 (70%)

Fig. No. 7: distribution of sternum samples on the basis of food habits

Discussion:

'Age determination is ultimately an art, not a precise science'-Maples (1989: 323)[4]

The present study is conducted in the Department of Forensic Medicine, Lady Hardinge Medical College, New Delhi on a total of 100 cases (70 males; 30 females) age more than 30 years that were brought for medicolegal autopsy after verification of age from necessary government documents. Sterna were removed from the cadavers, kept for maceration for a week and then cleaned and dried at room temperature. The manubrio-sternal and the xiphisternal articulations were carefully examined for degree of fusion: complete fusion, partial fusion and non-fusion and graded accordingly to determine the age.

Out of a total of one hundred samples of sternum retrieved from dead bodies, 11 male (15.7%) and 11 female (36.6%) sterni belonged to 30-40 years age bracket and 21(30%) males and 1 (3.3%) female sterni to 41-50 years whereas 20 (28.5%) male and 7 (23.3%) female sternum samples were in 51-60 age groups and 18 (25.7%) male and 11 (36.6%) female sterni belonged to >60 years age group. On statistical analysis fisher's test value is 12.99 and p- value is 0.004 that is statistically significant. In this study maximum number (28.5%) of male sternum samples belonged to 51-60 years age group whereas females topped the number (36.6%) in 30-40 years and more than 60 years age bracket.

The present study is in agreement with the study by Bruce where maximum number of sternum belonged to males (21.5%) in the 51-60 years age bracket and female sterni (18.4%) in more than 60 years age[5]. The distribution of age in the study of Chandresh I. Tailor is quite different from our study where he studied 116 cases that were more than 10 years of age and more than one third (34.2%) of male were in 21 to 30-year age bracket that was highest among the male group[6]. In the same way, female was highest (27.8%) among 21 to 30 years group. These were cases that were included as they were more than 30 years of age and met all the inclusion criteria. In another study by Chandrakanth HV 2012. a total of 118 sterna (67 males and 51 females) 27 and the male samples were aged between 25 and 74 years whereas the females between 20 and 80 years in study by Sobhan K. Das 14.28% in 30-35 years age amongst male and 13,4% in 36-45 years amongst females.[7] Sethi PD included 500 cases 371 in his study of which 74.2% were male, and 25.6% were females and one was eunuch i.e. 0.2 %[8]. Comparative analysis of age and sexwise distribution is shown in Table 6.

Table 6: Age Distribution of sternum samples				
Variable	**Age groups (Years)**			
	30-40	**41-50**	**51-60**	**>60**
Male	11 (15.7%)	21 (30%)	20 (28.5%)	18 (25.7%)
Female	11 (36.6%)	1 (3.3%)	7 (23.3%)	11 (36.6%)

Distribution of cases on the basis of built

In present study, out of the total one hundred samples of sternum retrieved from dead bodies maximum number of cases (22%) were of moderately built in > 60 years age bracket. On statistical analysis fisher's test value is 5.00 and p- value is 0.550. Maximum number of cases belonged to moderately built in both males and females. On statistical analysis chi square value is 0.760 and p-value is 0.498. None of the studies assessed had studied built of cases while determining age from sternum.

Distribution of cases on the basis of food habits

Out of the total one hundred sternum samples retrieved from dead bodies 8 (8%) belonged to individuals who are non-vegetarians (19%) in 51-60 years age bracket. On statistical analysis chi- square value is 0.754 and p- value is 0.862. On comparison of male and female maximum number of them are non-vegetarians. On statistical analysis chi- square value is 0.670 and p- value is 0.498. Similar to the present study, Chandresh I. Tailor has studied socio-demographic profile and stated that maximum that is near about three fifth (58.6%) of the cases in there were non-vegetarian and rest were of vegetarian similar to the present study.

However, none of the studies on age from sternum assessed have studied dietary variation in epiphyseal or joint union though some authors state that dietetic variations seemingly had no effect' on the progress of epiphyseal union in other bones[9]. (Table number 7)

Table 7: Comparative analysis of distribution on the basis of food habits				
Studies	**Veg**		**Non-Veg**	
	M	**F**	**M**	**F**
Chandresh I. Tailor 2013	38.2%	47.5%	61.8%	52.5%

Present study (2018)	38.5%	30%	61.4%	21%

Conclusions

The present study is an attempt to assess the age of an individual from the least studied and reliable skeletal remains, the sternum, which is one of the superficial bones, and is spared even in a highly decomposed body and can be easily procured from cadavers, without the slightest damage during routine autopsy procedure. This study was conducted in the department of Forensic Medicine and Toxicology, Lady Hardinge Medical College, New Delhi on a total of 100 cases brought to the mortuary for post-mortem examination. Majority of sternum samples retrieved from dead bodies of individuals brought for postmortem belonged to 51-60 years age group in males and 30-40 years age group in females. Males (70%) outnumbered the females (30%) in this study. Majority of sternum samples belonged to individual who were moderately built and had non-veg food habits.

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