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STUDY OF NAIL INJURY AND OTHER PATTERN INJURIES SUSTAINED AMONG VICTIMS OF PHYSICAL AND SEXUAL ASSAULT CASES

Kavita Dwivedi Research Scholar Sam Higginbottom University of Agriculture Technology and Science(SHUATS), Allahabad, Uttar Pradesh, INDIA

Dr.Lav kesharwani* Assistant Professor Sam Higginbottom University of Agriculture Technology and Science(SHUATS), Allahabad, Uttar Pradesh, INDIA *Corresponding Author

ABSTRACT

Introduction: The nail abrasions caused by the fingernails of the assailant often do not correspond to their shape i.e..cresentic of the work of any forensic physician or forensic pathologist. Nail marks plays an important role in personal identification in forensic case works. Medico-legal examination of superficial skin injuries specially caused by finger nail. If observed for fingernail abrasion and nail injury pattern will lead to tell tail sign of act which will be important evidence in jurisdiction for conviction of cases

Material and Methods: The study is a retrospective record based comparison study which was conducted among Female assault cases. Sample size for study was calculated by using formula for sample size for proportions the calculated sample size came out to be 75. The desired sample size was 75 Sexual assault cases selected randomly for the 3 cities from state medico-legal cell (UP). For comparison purpose, 75 cases (matched for age) of general assault were selected randomly from the medico-legal records of Rama Medical College Hospital & Research Centre, Kanpur.

Exclusion criteria: Cases not enclosing all necessary information (history and examination findings) in the reports submitted to State Medico-legal Cell and cases with fatal outcomes.

Results : Mean age of Sexual Assault Victims is 26.53 ± 9.18 and General assault victims is 30.41 ± 10.17.which is higher than sexual assault. Most of the victims 32 general assault and 47sexual assault were belonging to the lower socio-economic status, (χ^2= 6.461, 'p'= .040). [Table.2] Results shows that among most of the sexual assault nail injuries were present 41 cases Among general assault victims nail injuries were present only in 12 cases (χ^2 **= 24.538, p = .000**).[Table.3 figure below]. Study shows the results of logistic regression analysis with type of assault as dependent variable, to identify the effects of independent variables related to injuries. .Odds ratio is 11.36 (3.28- for site of injury with lower limit of 95% CI being 3.282. This implies that genital injuries are expected to be at least 3 times more in sexual assault. Similarly the odds are almost 2 times more for finger nail injury and shape of injury respectively. The odds ratio for direction of (force) amongst injuries is 5.128 with lower limit of 95% CI being 1.06 and for severity of injury odds ratio is 2.364 (statistically significant, p=.026)

KEYWORDS : Assailant, Victim Physical and sexual assault, finger nail injury.

INTRODUCTION:

The skin is one of the largest organs of the human body Goldsmith (1990) **[1]**. The total body surface of the skin varies from 0.2 m 2 in a full-term newborn to around 2 m 2 in an adult (Patient.co.uk 2007) **[2]** The skin weighs about 15% of the total body weight. It is also the most accessible organ of the human being and plays an important role in the communication between human beings. It is soft to allow movement, but tough enough to resist breaking or tearing.

The nail abrasions caused by the fingernails of the assailant often do not correspond to their shape i.e..cresentic of the work of any forensic physician or forensic pathologist. Nail marks plays an important role in personal identification in forensic case works. Nail marks can be recorded in violent crimes such as sexual violence, child abuse cases. Fingernail marks are superficially incised curvilinear abrasions, occurring singly or in sets. General physical injuries; 44% of studies found a significant positive association with legal outcome (the apprehension and interrogation of a suspect; the decision to forward a case for prosecution. Medico-legal examination of victims reviled superficial skin injuries specially caused by finger nail. If observed for fingernail abrasion and nail injury pattern will lead to tell tail sign of act which will be important evidence in jurisdiction for conviction of cases

MATERIALAND METHODS:

Study design: The study is a retrospective record based study which was conducted among Female assault cases. **Sample size** for study was calculated by using formula for sample size for proportions:

$$\text{Sample size (N)} \geq \frac{Z^2_{1-\alpha/2} \times p \times (1-p)}{d^2}$$

$Z_{1-\alpha/2}$ is the value of 'Z variate' for 95% confidence = (1. 96)

***P** is the prevalence = 0.58 (Prevalence of skin injuries among sexual assault victims)

q = **(1-P)**

d is the allowable error = 0.116 (20% of prevalence)

***Ingemann et al.** found that 78% of the victims in their study had injuries: **58% had skin injuries.[3]**

The calculated sample size came out to be 75. The desired sample size was equally divided into three cities (Kanpur, Allahabad & Lucknow). For doing so 25 random numbers were generated on software and the cases registered on these numbers were included in the study. This process resulted in 75 Sexual assault cases selected randomly for the 3 cities from state medico-legal cell (UP). For comparison purpose, 75 cases (matched for age) of general assault were selected randomly from the medico-legal records of Rama Medical College Hospital & Research Centre, Kanpur. **Ethical considerations:** We had an exemption for patient informed consent because we used computerized data devoid of patient identifiers (Name, Biometric ID, Victim photographs and other Personal ID). The study was approved by the Committee for Research Ethics Department of Forensic Science, Sam Higginbottom Institute of Agriculture Technology and Sciences**.** As the data set included police files, permission was also obtained from the State medico-legal cell, Lucknow (UP). In present study **body map/ sketches** were used to depict the evident injuries on the body of victims due to afore said reasons. Instead of using body sketches we adopted body map to depict the injuries sustained on the body of victim which were used during medico legal examinations. These body maps will more precise in site, size and measurement of injuries specially those measurement which cannot be correctly emphasized on body sketches by visualizing these. Scaling of body Maps enables the **measurements and imposition** of Injuries sustained on the body which can be clearly calculated. Injuries variables noted on predesigned pretested pro forma. Data thus obtained was tabulated and analyzed by using SPSS version 21 software.

Table 1 Mean age of General and Sexual Assault Victims

Type of Assault	N	Mean ± SD	't'	'P'
General Assault	75	30.41 ± 10.17 years	2.45	.015
Sexual Assault	75	26.53 ± 9.18 years		

Table No. 2 Socio-economic status of General and Sexual assault Victims

	Type of Assault		Total	(X2) Chi-Square	(' P'') Value
Socio-economic Status	General	Sexual			
Upper	14 (8.7%)	7 (9.3%)	21 (14.0%)	6.461	040
Middle	29 (38.7%)	21 (28.0%)	50 (33.3%)		

Lower	32 (42.7%)	47 (62.7%)	79 (52.7%)		
Total	75 (100.0%)	75 (100.0%)	1 50 (100.0%)		

Table 3: Nail Injuries Sustained Among General and Sexual Assault Victims

Nail Injury present	**Type of assault**		**Total**
	General assualt	**Sexual assault**	
Yes	12 (16.0%)	41 (54.7%)	53 (35.3%)
No	63 (84.0%)	34 (45.3%)	97 (64.7%)
Total	75 (100.0%)	75 (100.0%)	150 (100.0%)
χ^2 = 24.538, p = .000			

Table 4: Results of LRA with type of assault as dependent variable

Variables in Equation	**B**	**'p'**	**Odds Ratio**	**95% C.I. for Odds Ratio**	
				Lower	**Upper**
Site of Injury	2.430	.000	11.361	3.28	39.32
Finger Nail Injury	1.676	.000	5.347	2.12	13.51
Shape of Nail Injury	1.633	.003	5.120	1.767	14.838
Direction of Force	1.637	.041	5.128	1.06	25.00
Severity	.860	.026	2.364	1.10	5.05

RESULT AND DISCUSSION

Mean age of sexual assault victims 26.53 ± 9.18 and General/physical assault victims is 30.41 ± 10.17.which is higher than sexual assault. Independent Sample t- test to compare the difference in mean age between the two groups shows mean age is higher in cases of general assault (30.41 ± 10.17 years) as compared to cases of sexual assault (26.53 ± 9.18 years). This difference of age in two types of assault is statistically significant ('t' = 2.45; p = 0.015). Most 41 (54.7%) sexual assault Victims and 28 (37.3%) general assault victims were in age group 15-29 years This shows that younger age group females were more vulnerable for sexual assault.[Table.1] **Palmer CM, McNulty AM, D' Este C, Donovan B.** in their study **Genital injuries in women reporting sexual assault [4]** were also found similar results. Out of 164 females, 44% were less than 20 years of age, mean age was 24.2, range 13-74 years.

Most of the victims 32 general assault and 47sexual assault were belonging to the lower socio-economic status , 29 and 21 belonging to middle class and only 14 and 7victims respectively belonging to upper class. This shows the fact that Lower and middle class victims were more vulnerable to sexual assault. This association between socio-economic status of victims and assault against them was found statistically significant (χ^2= 6.461, 'p'= .040). [Table.2] **Dr. Indrani Das et al. [5]** also found similar results in their study Out of the 50 respondents, majority 36%, belonged to the Poor class.

Among most of the sexual assault victims nail injuries were present in 41 cases and in 34 nail injuries were absent. Among general assault victims nail injuries were present only in 12 cases and absent in 63 cases. This association between type of assault and presence of nail injuries was found statistically significant (χ^2 = **24.538, p = .000**).[Table.3 figure above]

Study shows the results of **logistic regression analysis with (**type of assault **as** dependent variable**)**, to identify the effects of 5 variables related to injuries. Odds Ratio calculated were .Odds ratio is 11.36 for site of injury with lower limit of 95% CI being 3.282. This implies that genital injuries are expected to be at least 3 times more in sexual assault. Similarly the odds are almost 2 times more for finger nail injury and shape of injury respectively. The odds ratio for direction of (force) amongst injuries is 5.128 with lower limit of 95% CI being 1.06 and for severity of injury odds ratio is 2.364 (statistically significant, p=.026) **Anderson S. Natalie McClain Ralph J. Riviello [6]** In their study Genital Findings of Women After Consensual and Nonconsensual Intercourse found that the odds ratio for direction of (force) amongst injuries is 5.128 with lower limit of 95% CI being 1.06 and for severity of injury odds ratio is 2.364 (statistically significant, p=.026). The participants who had the presence of ecchymosis were 5.4 times more likely to be in the N-CONS group than the CONS group (X= 22.882, df = 1, p =0.090)

CONCLUSION:

Present study concluded the important aspects of injury patterns and their medical and legal significance which may be added to conviction of assailants as legal/ scientific evidences.

Direction of force causing finger nail injuries patterns are dependent on the relative positions of victims and assailants thus in sexual assault relative position of assailant and victim explains the downward direction of force while nail injury sustained. Our study shows that Sexual assault victims who resisted the act of assault sustained more finger nail injuries 43 (81.1%) than who did not resisted due to various reasons were sustained lesser injuries only 10 (18.9%).

Limitation: Crime construction is not possible with the results of present study because we were not interviewed or encountered to victims or accused, only type of assault (sexual/general) can be constructed by using injury patterns on body of victims and history narrated by them. As present study was conducted using secondary data collected by reviewing Medico legal examination reports of sexual assault victims submitted to the medico legal cell (U.P). Most of the medico-legal reports prepared by medical professionals who given priority and importance to the injuries which were severe and may be life threatening. It is justified also in their view because once life is lost it will not in capacity of any one to restore it. Although the minor (less severe) injuries and pattern injuries which are paramount importance legally that can be telltale signs towards conviction of assailants among sexual assault cases e.g. abrasions bites bruises and scratches (Finger nail injures) which were lacking in details like shape, direction of force and cased by, these all are core issues of present study.

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