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# Genital findings in adult females: a forensic analysis of photographic records

Dalia Al-Saif<sup>1\*</sup> , Maram Al-Farayedhi<sup>1</sup>, Ghada Al-Shamsi<sup>1</sup>, Azzah Al-Zahrani<sup>1</sup> and Marwah Al-Bayat<sup>1</sup>

## Abstract

**Background** In the investigation of sexual assault cases, a standard practice involves examining female genitalia to identify injuries. The majority of research was done to examine findings in the child age group, but very little research was done on the adult age group. There is a need for guidelines to follow for the interpretation of adult female findings as they hold the same significance as in children. The Dammam Forensic Medicine Center conducted a retrospective chart review study in the period from 2014 to 2021 to examine adult female genital findings utilizing photographic documentation.

**Results** One hundred sixty-three cases involving adults between the ages of 18 and 52 were examined. Cases were divided into two groups to focus on hymenal findings that fell in the class of no expert consensus. The first group included self-defined virgins, who denied having ever experienced vaginal penetration in their entire lives, including the reported incidence, which represented 38 cases. The rest of the cases had at least a single incident of vaginal penetration. The normal genitourinary findings were found comparable to those in the child age group. All of the participants who showed notches or clefts, below the 3 o'clock or 9 o'clock location, which extends nearly to the base of the hymen, but is not a complete transection belonged to the group with a history of vaginal penetration. The three participants who showed a notch or a cleft in the hymen rim at 3 o'clock or 9 o'clock which extends nearly to the base of the hymen, but is not a complete transection belonged to the same group.

**Conclusions** Findings that lack expert consensus in the child age group are likely the result of injury in the study participants. This result gives valuable information on genital findings in self-identified virgin adult females, which can be utilized in conjunction with other studies to establish standards for the assessment of cases of alleged sexual assault in adult females.

**Keywords** Sexual assault, Female adult, Hymen, Virgin, Forensic examination

## Background

The examination of genitals has been a standard in the evaluation of suspicious cases of sexual assault. The presence of injuries can be correlated with the incident and gives a strong clue supportive of the allegation. However, there is a lot of controversy surrounding the absence of injuries in such cases. Researchers have provided several

explanations for the absence of injuries. Some were anatomical, others were related to the nature of the assault and the age of the victim, and some concluded that normal examination does not rule out the possibility of sexual assault (Adams, 1994; Anderst, 2009).

Differentiating normal genital findings from those that indicate injury is very critical. While the majority of published papers focused on normal appearance and injuries in the young age group (Berenson, 1991; Berenson, 2002; Adams, 2004), literature is scanty in regards to normal genital features in adult females. Part of this is explained by the expected previous sexual activity of adults compared to children. This places the burden on proving

\*Correspondence:

Dalia Al-Saif  
alsaid@yahoo.com

<sup>1</sup> Forensic Medicine Center, Eastern Province, Dammam, Saudi Arabia

whether the questioned incident is a consensual act or not, which was well-researched (Astrup, 2011; Astrup, 2013), rather than proving the presence of injuries and using them as an indicator of assault. Additionally, studies on adolescents are limited and there was a call for longitudinal studies for a better understanding of the development of hymen in this age group (Edgardh, 2002).

The paucity of research in this area makes experts rely on their experience and peer reviews with colleagues, together with data from younger age groups. It was noticed that for those very few studies on adult female genitalia, the studied population is mostly sexually active (Biggs, 1998; Suttipaisit, 2018), therefore, there is still a gap in the literature for the self-defined virgin adult females.

Lack of photographic documentation of genitals in the evaluation of sexual assaults involving adults contributed to the low number of research in this area and was reflected in the expert opinions in court. Brennan discussed the objections to photographic documentation of adult genitalia and emphasized their importance in research (Brennan, 2006). In the Dammam Forensic Medicine clinic, the anogenital examination of all age groups is routinely photographed after taking a written consent, as part of the evaluation of sexual assault complainants. This involves taking still photos with a camera and/or video recordings using a colposcope.

Research was needed to fill the gap in the literature regarding normal anogenital findings in adult females, as evidenced by its scarcity. One might anticipate many adult females with genitalia that can be examined for normal findings in Saudi Arabia since people are not supposed to engage in sexual activity beyond marriage. The objective of this study is to examine genital findings in adult females in order to establish baseline standards for examining sexual assault complainants for the existence of findings indicating sexual assault.

## Methods

From October 2014 to February 2021, a retrospective chart review study was carried out at the Dammam Forensic Medicine Center. Charts of females who presented to the forensic clinic with an allegation of sexual assault and court cases for determination of consummation of marriage (which is required to determine the type of divorce for legal proceedings) were reviewed. Charts of those aged 18 years and above were extracted and only those with available photographic documentation of the genital examination were included in the study. The colposcope was mostly used to take pictures (still and video recordings), with a professional digital camera being used for a small number of still images. With the assistance of the nurse, the forensic medicine examiner takes the

pictures and determines the number of photos for each case based on the quality of the images. The high-resolution, uncompressed, JPG file photos are saved on an external hard drive. The main reason for the poor quality images that resulted in extra shots being taken was moving during the photo shoot.

One researcher coded and blinded the photographs by deleting all identifying information, including the examiner's name. Before recording findings, three board-certified forensic medicine experts with 12–16 years of experience examined the images and discussed the findings before reaching a conclusion in each case. For every case, all captured images (ranging from three to ten images) were examined to obtain a clearer picture of the genital region. A spreadsheet was filled with variables including the type of hymen, normal hymen variants, acute hymen trauma, healed hymen injuries, hymen findings with no expert consensus, vulval and anal normal variants and injuries. Variables were defined according to Adams classification (Adams, 2018; Kellogg, 2023).

Another spreadsheet was filled by one researcher with data that were extracted from the files and linked back to cases. Data included age, reason for presentation, previous vaginal penetration, childbirth, type of sexual contact in the alleged incident, and timing of the contact. Descriptive data analysis was done using IBM SPSS version 29.

More focus was placed on cases of self-identified virgins who showed up at the forensic clinic within 24 h of the event, claiming no vaginal penetration, and who were found to have no acute injuries upon examination. Findings of no expert consensus were examined in these cases.

Ethical approval was obtained from the IRB of the General Directorate of Health Affairs, Dammam, Saudi Arabia, No. MD-FM-02.

## Results

A total of 163 cases met the inclusion criteria in the study period. The mean age of the participants was 25.78 years with a standard deviation of 6.4 and a range of 18–52 years. The majority of participants were referred by the police as cases of sexual assault ( $n$ : 151, 92.6%), with only 12 cases (7.4%) referred by the court as cases of conflict divorce to verify consummation of marriage by examining the hymen for injuries.

Regarding the prior sexual activity of participants, 86 participants (52.8%) admitted being sexually active before the alleged incident compared to 77 participants (47.2%) who claimed never been involved in any form of sexual activity before the alleged incident. Thirty-eight out of these, denied any vaginal penetration in their whole life including the alleged incident.

As to the details of the incident for which they presented, 90 participants (56.3%) disclosed vaginal

penetration, 27 (16.9%) disclosed anal penetration, and 19 (11.9%) reported both anal and vaginal penetration. Participants who denied any form of sexual contact, vaginal or anal, were 24 (15%). Time since the alleged sexual contact was mainly less than three days, with 26.2% of the total cases presented less than 24 h from the alleged incident. General body examination reported injuries in 54 participants (33.1%).

Photographic documentation of the genital examination involved both still photos and colposcopic video recordings with 117 participants (71.8%) having both types of documentation, 37 (22.7%) having only still photos, and 9 (5.5%) having only video recordings.

The types of the hymen are shown in Table 1. with the annular and crescent types representing the majority (35% and 28.8% respectively) and the caruncula representing 33.7% of the cases. Normal genital findings were compared to findings of other studies on children in Table 2.

Regarding injuries in the genital area excluding the hymen, only three cases (1.8%) had vulvar injuries, and 22 cases (13.5%) had perianal injuries. The majority (72%) of these injuries were in participants with no previous sexual activity.

Acute injuries of the hymen were found in eight cases. Five cases with tears, all in participants of no previous sexual activity, and three with abrasions, all in participants with previous sexual activity. Apart from

caruncula, healed injuries of the hymen were present as old tears in 13 cases and loss of tissue in 15 cases.

The study focused on hymenal findings that fell in the class of no expert consensus according to Adams classification. In this class, there is disagreement among experts about the relevance level. Although some studies have linked certain physical characteristics to a history of sexual abuse, experts are now at variance about how much weight to assign these findings in relation to abuse. These findings included a notch or cleft in the hymen rim, at or below the 3 o'clock or 9 o'clock location, which extends nearly to the base of the hymen but is not a complete transection, and complete cleft/suspected transection to the base of the hymen at the 3 or 9 o'clock location (Adams, 2018; Kellogg, 2023). To put an emphasis on this particular set of findings, the reviewed cases were classified into two groups. The first group included participants who did not report any history of previous sexual activity and denied any vaginal penetration in the alleged incident and who didn't show any of the findings that confirm old or recent vaginal penetration (expected to have normal hymen), and the second group including the rest of the cases.

Table 3 shows the distribution of no expert consensus findings between the two groups. The first group involved 38 participants compared to 70 participants in the second group. Five participants showed notches or clefts, below the 3 o'clock or 9 o'clock location, which extends nearly to the base of the hymen but is not a complete transection. All of them belong to the second group who had an old or recent history of vaginal penetration and none belonged to the group with no history of vaginal penetration. As to the presence of a notch or cleft in the hymen rim at 3 o'clock or 9 o'clock which extends nearly to the base of the hymen, but is not a complete transection, three participants were involved in the 2nd group (Fig. 1). The only one case with deep notches at both 3 o'clock and 9 o'clock was in the 1st group (Fig. 2).

**Table 1** Frequency and percentages of hymen types

Type of hymen	Frequency	Percent
Annular	57	35
Crescent	47	28.8
Septate	1	0.6
Caruncula	55	33.7
Ruffled	2	1.2
Sleeve	1	0.6

**Table 2** Normal genital variants compared with other studies

Normal finding	Study participants (18–52 years)	McCann et al. 1990 (10 months–10 years)	Heger et al. 2002 (premenarchal)	Berenson et al. 1992 (1 months–7 years)
Internal vaginal ridge	28.9%	90%	94%	25%
Hymenal tag	15.8%	18.5%	3.4%	3%
Bumps and mounds	2.6%	34%	34%	7%
Hymen superficial notch	0%	6% (anterior and posterior)	18% (posterior)	
Vestibular bands	39.5%			98%
External hymenal ridge	7.9%			15%

**Table 3** The distribution of no expert consensus findings between self-defined virgins and the rest of cases

Hymen finding	Self-defined virgins (n:38)	The rest of cases (n: 70)
Complete cleft at 9	–	2
Complete cleft at 3	–	–
Complete cleft at both 3 and 9	–	–
Notch at 9 not reaching base of hymen	–	1
Notch at 3 not reaching base of hymen	–	2
Notch at both 3 and 9 not reaching base of hymen	1	–
Notch below 3 and 9 not reaching base of hymen	–	5

**Fig. 1** The hymen showing deep notch at 9 o'clock

In regards to complete cleft/suspected transection to the base of the hymen at 3 or 9 o'clock, 2 participants had clefts at 9 o'clock (Fig. 3) and they belong to the second group while none were found at 3 o'clock in both groups.

### Discussion

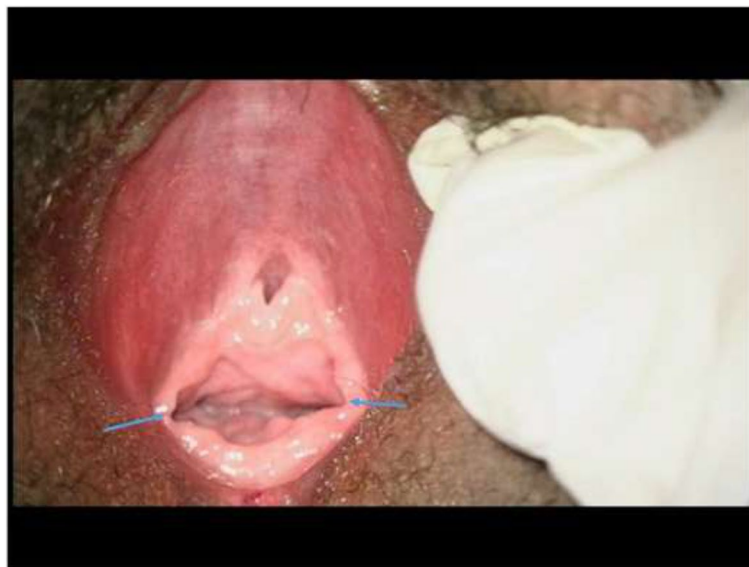
This study was based on multiple expert reviews of photo documentation of genital areas in adult females. The reproducibility of interpretation by reviewing colposcopic photographs was studied previously and showed moderate agreement between the examiner and photo reviewer. However, acknowledging the limitations of that study, colposcope was found still eligible for use as it provides an objective method for the assessment of

sexual assault cases (Astrup, 2013). Several researches on adults were conducted without photographic documentation relying on the initial examination by a single expert, which puts a limitation on the results, and limits the potential research that can be conducted in this area.

In the few studies that included only adult females, the majority of participants admitted having sexual intercourse, whether related to the alleged incident or ahead of it (McClean, 2011; Lincoln, 2013). Suttipassit included only 13 participants who were not sexually active in their study (Suttipassit, 2018), while this study involved 38 cases with no history of vaginal penetration including the alleged incident. This gives an opportunity for a better description of normal and no-expert consensus



**Fig. 2** The hymen showing deep notches at both 3 and 9 o'clock



**Fig. 3** The hymen showing complete cleft at 9 o'clock

findings. Annular and crescentic types of hymen, consistent with published studies on children (Mor, 1986; Berenson, 1991), represented the majority of cases (63.8%), making a better recognition of findings.

Normal findings in Adams classification that involved only the child age group (Adam, 2018; Kellogg, 2023) were considered normal in participants in this study due to a lack of data on adults. The presence of such findings could be explained by their existence through adulthood with age, parity, abuse history, and hormonal milestones all impacting what is assumed to be normal (Brennan,

2006). Normal findings were calculated in participants with no history of vaginal penetration. Less internal vaginal ridges and fewer bumps and mounds were found compared to studies by Heger and McCann on children, but comparable to Berenson's study (McCann, 1990; Heger, 2002). The most common normal finding was vestibular bands (39.5%) which was common also in the child age group as found by Berenson in 98% of participants (Berenson, 1992).

Acute injuries of the genitals represented only 20% of the participants. We expect a low frequency of injuries



because of tissue elasticity with pubertal hormones that should be set at this age group (Pokorny, 1998). Injuries were found more in participants with no previous sexual activity, which is in accordance with a study by Biggs that included different age groups including adults (Biggs, 1998; Adams, 2001).

The comparison between findings in consensual and nonconsensual sexual intercourse is not feasible in participants. This is explained by the consequences on the adult female in the case of admitting a consensual act that is beyond marriage.

Results concerning findings without expert consensus, classified based on child age group studies, suggest they are the result of trauma in the adult age group. In this study, the majority of incomplete defects at 3/9 o'clock (three cases) and all defects below 3 and 9 o'clock (five cases) occurred in participants with a history of vaginal penetration. A single case that has this finding symmetrically at both 3 and 9 o'clock belonged to the group with no history of vaginal penetration. This is consistent with findings in the Suttipassit study in which they found that what they referred to as, tears below 3 and 9 o'clock are significantly more in those with previous history of sexual intercourse (Suttipassit, 2018). Adams said that unless an acute injury was noted in the same area, these results are uncommon and should be interpreted cautiously (Adams, 2018; Kellogg, 2023). This also applied to clefts reaching the wall of the vagina, where two cases had them at 9 o'clock and both had a history of vaginal penetration.

## Conclusions

Findings that lack expert consensus in the child age group were found to be more likely the result of injury in the adult age group. This can be used together with other circumstantial evidence to support an allegation of sexual assault in adult females. The research's findings can be utilized to establish standards for the assessment of adult female sexual assault cases. However, the examiner should use caution when interpreting these results until high-quality research with a larger sample group is available.

## Limitations

Since this was a retrospective study, certain images' clarity was impacted because the photos were not taken according to a set methodology from a particular angle. Instead of relying on the review of images, the study would be best conducted in a prospective design with a clearly defined protocol or with clear requirements to register by the examiner directly during the examination.

Credibility of participants regarding previous sexual activity and details of the alleged incident could be affected by different factors. This applies to court cases for reasons related to legal proceedings of divorce, and to girls who are expected to deny sexual activity avoiding social repercussions.

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None.

## Authors' contributions

The authors together contributed to the design and implementation of the research, the analysis of the results, and the writing of the manuscript.

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## Availability of data and materials

The data reported in this study are available upon request.

## Declarations

### Ethics approval and consent to participate

Ethical approval was obtained from the IRB of the General Directorate of Health Affairs, Dammam, Saudi Arabia, No. MD-FM-02. A written consent was taken from each participant before the examination.

### Consent for publication

A written consent was taken from each participant for taking photographs and using them with other unidentifiable data in studies and publications.

### Competing interests

The authors declare that they have no competing interests.

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