

# Factors Associated with the Development of Ventral Hernias and Healthcare Seeking Behaviors in a Cohort of Pakistani Women

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## ABSTRACT

**Background:** Anterior abdominal wall hernias constitute one of the most common surgical presentations. According to the World Bank data Pakistan has one of the highest birth rates per woman in the region at 3.6 births per woman. In Pakistan there has also been a large increase in C-section rates with nearly 20% of all pregnancies being delivered via C-section, nearly 1 out of every 5 births. Multi-parity is a risk factor for developing paraumbilical hernias and C-sections lead to incisional hernia developments.

**Methodology:** The study conducted was a cross-sectional study at a tertiary care hospital in the department of surgery from 1<sup>st</sup> June 2021 till 1<sup>st</sup> September 2021. Any woman presenting with a ventral hernia to the clinic was asked to fill out a questionnaire. 60 women presented over the study period and were enrolled.

**Results:** Fifty five percent paraumbilical hernias and 41.7% incisional hernias were reported. The mean number of pregnancies was 4.10 S.D 1.531 with a range from 0-8. C-sections were 2 times more common than SVDs. Increasing number of pregnancies associated with younger age of onset. Higher number of vaginal deliveries and C-sections were each associated with the development of a ventral hernia.

**Conclusion:** The high fertility rate and C-section rate in Pakistan incurs a huge risk to women developing ventral hernias and poses a burden to the public healthcare system.

**Keywords:** Paraumbilical hernia; parity; Pakistan

## INTRODUCTION

Anterior abdominal wall hernias constitute one of the most common surgical presentations. These hernias occur at sites of the abdominal wall where a weakness has developed or deficiency of muscular or fascial layers confers a natural tendency to develop protrusion of intra-abdominal contents. Anterior abdominal wall hernias may be of the epigastric, paraumbilical, umbilical or inguinal type amongst other rarer hernias<sup>1</sup>.

Paraumbilical hernias unlike umbilical hernias occur through the linea alba and not through the umbilical scar. These are usually within three centimeters of the umbilicus. They account for nearly 10% of all ventral hernias in adults with the majority being acquired rather than congenital<sup>2</sup>.

Paraumbilical hernias occur more commonly in women with nearly 3 women affected for each male. These women may be obese or have a history of multiple births. Another cohort of people at risk for developing a paraumbilical hernia are patients with gross ascites, who develop the condition due to increased intra-abdominal pressure<sup>2</sup>.

The mechanism behind developing a ventral hernia is a combination of factors. Increased intra-abdominal pressure pushes the contents against the abdominal wall, this sustained pressure creates a situation where the muscle stretches and gives way to allow the contents to extrude and decrease the pressure build-up. Similarly weight lifting, pregnancies and other factors that cause stretch on the muscle fibers causes them to thin out and create a situation where they are unable to contain intra-abdominal contents. The hernial sac may contain omentum, pre-peritoneal fat or bowel loops. In general the neck of the sac is narrow due to which incarceration or strangulation of hernia sac contents may occur<sup>2</sup>.

According to the World Bank data Pakistan has one of the highest birth rates per woman in the region at 3.6 births per woman and the total contraception prevalence rate is extremely low at 35%<sup>3</sup>. This cohort relates to a large percentage of women in the country who are multi-parous and at risk of developing a paraumbilical hernia and requiring surgery. In Pakistan there has also been a large increase in C-section rates with nearly 20% of all pregnancies being delivered via c-section, nearly 1 out of every 5 births<sup>4</sup>. C-sections are an independent risk factor for the development of ventral wall hernias, especially incisional hernias, with the risk increasing three times with the second c-section<sup>5</sup>. Thus in Pakistani women where multiparity is prevalent and c-sections are now extremely common women are at a huge risk of developing a ventral wall hernia that would need

surgical repair. It is estimated that nearly 5% of all c-section wounds will develop an incisional hernia that will need surgical repair and of all abdominal incisions upto 20% may develop an incisional hernia<sup>6</sup>.

The literature requires concrete evidence for South Asian women to assess how the risk of developing a ventral hernia increases and to what extent with pregnancy. This risk stratification could enhance counseling outcomes for women and avoid surgery by prevention of ventral hernia development.

## METHODOLOGY

The study conducted was a cross-sectional study at a tertiary care hospital in the department of surgery from 1<sup>st</sup> June 2021 till 1<sup>st</sup> September 2021 after approval from the Ethical Review Board. Simple convenience sampling was done, where any woman presenting with a ventral hernia to the clinic was asked to fill out a questionnaire after informed consent. 60 women presented over the study period and were enrolled. Data regarding demographics, hernia characteristics, timeline of hernia development, and information regarding pregnancies was recorded. SPSS v24.0 was used for statistical analysis.

## RESULTS

Sixty women were asked to fill out a proforma.

**Demographics:** The age range of the women was 26-78 years. The mean age was 45.4 S.D 12.6 years. The mean BMI of women was 31.4 S.D 5.14 kg/m<sup>2</sup> and the mean weight of participants was 78 S.D 12.68kg. The abdominal girth of women was measured and we found that the mean abdominal girth was 40 S.D 4.14 inches. Fifty nine women were married, 1 woman was unmarried. The mean year of being married was 21.5 S.D 12.2 years.

**Hernia Characteristics:** Respondents had a mean time in years since occurrence of hernia and presentation of 2.96 S.D 3.87 years. The mean age at occurrence of hernia was 42.5 S.D 11.5 years. Table 1 shows the distribution of types of ventral hernias that presented to our clinic.

Table 1: Frequency distribution of types of ventral hernias (n=60).

| Type of hernia | Frequency | Percentage |
|----------------|-----------|------------|
| Epigastric     | 1         | 1.7        |
| Incisional     | 25        | 41.7       |
| Paraumbilical  | 33        | 55         |
| Umbilical      | 1         | 1.7        |

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Patients presented with a constellation of symptoms these were enlisted and are shown in table 2.

Table 2: Frequency distribution of presenting symptoms (n=60)

| Symptoms              | Frequency | Percentage |
|-----------------------|-----------|------------|
| Constipation          | 20        | 33.3       |
| Nausea and Vomiting   | 6         | 10         |
| Abdominal Pain        | 34        | 56.6       |
| Epigastric tenderness | 1         | 1.66       |
| Asymptomatic          | 10        | 16.6       |

The mean defect size was 10.5 S.D 1.56mm on ultrasound. 2(3.3%) respondents did not have an ultrasound commenting on sac contents, 22(36.7%) had bowel loops present in the sac, 22(36.7%) had omentum and 14(23.3%) at the time of ultrasound could only visualize a defect and found the sac to be empty.

**Parity status of women:** The mean number of pregnancies was 4.10 S.D 1.531 with a range from 0-8.

Table 3. Frequency distribution of the number of pregnancies for the respondents. (n=60).

| Number of Pregnancies | Frequency | Percentage |
|-----------------------|-----------|------------|
| 0                     | 1         | 1.7        |
| 2                     | 10        | 16.7       |
| 3                     | 14        | 23.3       |
| 4                     | 11        | 18.3       |
| 5                     | 11        | 18.3       |
| 6                     | 7         | 11.7       |
| 7                     | 5         | 8.3        |
| 8                     | 1         | 1.7        |

The mean number of alive children was 3.83 S.D 1.53. In our cohort some women had multiple gestations. The mean number of miscarriages were 0.28 S.D 0.67. 9 women had experienced a miscarriage, 7 experienced 2 and 2 experienced 1. The mean number of simple vaginal deliveries was 1.73 S.D 1.846 and the mean number of C-sections was 2.44 S.D 1.622. The mode for simple vaginal deliveries was 0 and for C-sections was 3. For each woman their birth spacing was averaged for all their pregnancies. Mean of the average birth spacing was 2.15 S.D 1.01 years. None of these women had a hernia present during their pregnancy or were pregnant at the time of presentation. None of these women had ever had a hernia during their pregnancy that contained the gravid uterus. Women were asked the reason why they did not seek consultation for their hernia at the time of occurrence and the reasons behind their delay in seeking care.

4(6.7%) women responded that they were afraid of surgery, 55(91.7%) women responded at the time they did not have knowledge that the hernia needed surgery until they were told by family or friends and 1(1.7%) responded that she did not seek care as she was asymptomatic.

**Association Analysis:** A student t-test was done to see if the age of onset of hernia was associated with the number of pregnancies. We obtained a p-value of 0.001 thus showing that a significant association existed. The more the number of pregnancies the earlier the age of onset of hernia.

Similarly t-test was used to analyse whether an increase in number of SVDs or C-sections was associated with an earlier age of onset of hernia and we found for both a p-value of 0.001 thus there was a clear association between developing a hernia earlier with increased number of both normal deliveries and c-sections.

A chi-square test was done to see if type of hernia was associated with BMI. We obtained a p-value of 0.82, thus showing that there was no association between BMI and developing any particular hernia. Odds ratio was calculated for having a paraumbilical hernia and a BMI greater than 27.5. The odds ratio calculated was 2.87.

The odds ratio was calculated for having an incisional hernia with a BMI greater than 27.5 and was calculated to be 0.26.

For women with more than 2 SVDs the odds of having an incisional hernia was 4 times that for women with 2 or less SVDs. For women with more than 2 SVDs the odds of having a paraumbilical hernia was 0.58 times more than women with less than 2 SVDs.

The odds of developing an incisional hernia for women with 3 or more c-sections was found to be 0.52. The odds of developing a paraumbilical hernia with 3 or more c-sections was found to be 2.18 times higher.

A t-test was done to see if the time until presentation was associated with abdominal circumference and we found a p-value of 0.001 signifying an association existed. Women with larger abdominal circumferences presented earlier as compared to women who presented later.

## DISCUSSION

A large percentage of ventral hernias can be avoided in Pakistani women with better family planning and decreased pregnancies and avoiding unnecessary c-sections in women.

Our study participants had a large age range representative of women of all decades of life. The mean BMI was 31.4 S.D 5.14 kg/m<sup>2</sup> thus for the majority of respondents we can conclude that presenting with a ventral hernia is associated with being overweight. This is in light of the fact that obesity can be identified in South Asian descent Indians or Pakistanis with a BMI of greater than 25kg/m<sup>2</sup>.<sup>7</sup> We further found that abdominal circumference was a factor that could explain delayed presentation in women. Women with larger waists presented earlier as compared to women with smaller abdominal girths. This could be explained by seeking medical attention when there is visibly a larger deformity or change in body habitus. The mean abdominal girth was 40 S.D 4.14 inches, women who presented later all had an abdominal girth of less than 44 inches.

Of the 60 women who presented to us, 59 were married and had children, only 1 woman was unmarried and did not have any children. This shows a clear relationship of multiparity and marital status with development of a ventral hernia. The literature shows a 7 fold risk for women who have had children to undergo a hernia repair as compared to women with no pregnancies, and women who have had a hernia repair have a 1.6 increased chance of developing a hernia recurrence following another pregnancy<sup>8</sup>. Further, the marital causation model has proven over time that married individuals are more likely to be obese and thus it can be considered an independent risk factor for developing ventral hernias<sup>9</sup>. As a clinician it may be prudent not to counsel against marriage or pregnancy, however one can stress on self-care, weight management despite the marital role, and controlled fewer pregnancies with adequate birth spacing such that weight gain in pregnancy is shed prior to conceiving again.

Most women presented to us in their middle ages and the majority of women presented 3 years after developing a hernia. We found that lack of knowledge on the part of the participants that surgical repair is needed hindered them from seeking care, fear of surgery and not having symptoms. There may be a multitude of reasons why women present late, and in Pakistan women due to their marital role and access to travel<sup>10</sup> being a barrier are likely to present later. The role of the general or primary physician is stressed here in spreading information and guiding their patients to make lifestyle changes to decrease the chances of developing a ventral hernia and to seek care earlier when one develops. We interviewed three of the women who presented to us later than a year and in the age range of 35-45 to elaborate as to why they presented beyond 3 months of developing a hernia, the responses were recorded.

"My youngest child was 3 months old then and my elder children were in school. I had too many responsibilities at the time and my husband was not supportive as he said that you have no pain let it be for now. I could not come to the hospital without my husband though I wanted to have it checked. Now my children are older and since I have had to go to the emergency room to get pain killers when pain occurred my husband agreed to bring me to get operated."

"When it developed it was small and it would not cause me any trouble. My mother in law told me this happens to many women and it is not something to worry about. I had thought about coming earlier but my children had school, then Corona happened and doctors were not available so I waited but now it has become bigger and it bothers me so I have come."

"I used to have some pain in it when it was smaller but I ignored it. My relatives told me that the doctors will do a surgery and they will place a iron mesh inside my stomach and it will get infected and I will die. I was scared of the surgery so I decided to wait and check it only if it became much bigger."

Myths have been an integral reason Pakistan has faced barriers to healthcare<sup>11</sup> and dispelling these are important for timely healthcare seeking practices and behaviours. Women may be told that their predicament is normal and all women face it and treatment is not needed, or they may be told that unless there is pain it is not

problematic or in the case of one of our participants being told that an iron mesh would be placed which would surely lead to demise. These myths can only be dispelled by increasing health equity and information sharing with the community for diseases that affect populations commonly. Ventral hernias are a very common presentation and there is little information or awareness that is given to them at the community level. Another barrier to health-care that we are less likely to account for is decision making capacity for the South Asian woman in a traditional set-up<sup>10</sup>. Women may find that even if they wish to seek healthcare they may be obstructed by unsupportive spouses who may not have the time to bring them to a hospital and will not allow them to travel unescorted or by the interference of relatives who will persuade the spouse to not seek healthcare. Similarly in the case of women who are unmarried and living with their parents, the parent is the ultimate decision maker and thus women face the burden of consistently partaking in unilateral decision making, which is made for them. Education regarding common healthcare issues such as ventral hernias and when and why to seek care should be imparted to men as well as women to ensure that an informed male may be more likely to bring a woman to the hospital for treatment in such a situation rather than delaying care.

Of the ventral hernias the most common were incisional and paraumbilical hernias in women, with half of all cases being paraumbilical. The least common were epigastric and umbilical hernias. Considering the risk factors these women had of being overweight and having multiple pregnancies in essence this pattern is predictable and is likely true for the rest of Pakistan. Women commonly only presented when they perceived they had abdominal pain due to the swelling. We have already seen that this pattern could be justifiable by the societal structure that women live in, in Pakistan. Healthcare seeking behavior is defined more by responsibilities to others and unilateral decision making where the patient themselves are sidelined; thus pain or symptoms that are causing obstruction to the role of the woman in the household leads to healthcare seeking behavior.

We found that the women in our cohort had a mean number of pregnancies of 4.10 and mean number of alive children 3.83. This is similar to the rate of 3.6 births per woman as per the World Bank data and it shows that at any cohort the Pakistani woman continues to have a high fertility rate. The mean number of vaginal deliveries was 1.73 however for c-sections it was double at 2.44. The mode for c-sections was 3, showing that the most common number of c-sections women had had in our cohort was 3. This again in line with the literature that shows that there are far more women undergoing C-sections in Pakistan<sup>4</sup> as compared to normal delivery which coupled with a high fertility rate puts these women at a high risk of developing incisional hernias. The average birth spacing as also low at only 36 months in our cohort. Repeated pregnancies with smaller birth spacing times leads to repeated stretch of the abdominal wall musculature and causes microtears that further weakens it and leads to development of ventral hernias.

We found that having more pregnancies was an independent risk factor for developing a hernia earlier. Most incisional hernias or paraumbilical hernias will develop later in life when ageing causes weakened musculature mostly after the 6<sup>th</sup> decade<sup>12</sup>. Incisional hernias further are the most common hernia encountered in women from the 4<sup>th</sup> decade onwards, and complications increase with age<sup>13</sup>. Women empowered with the knowledge that complications of a hernia are more likely to occur if left untreated and with time and age may decrease the lag time in presenting to the surgical clinic. We further found that having more vaginal deliveries and C-sections were risk factors for developing a ventral hernia. In women who had only had simple vaginal deliveries more than twice the odds of developing a paraumbilical hernia was 0.58 times more than women with less than 2 vaginal deliveries. In women who had had 2 or more simple vaginal deliveries and a c-section, the odds of developing an incisional hernia was 4 times higher than women who had less than 2 simple vaginal deliveries and a c-section. This shows that women who have had simple vaginal deliveries and then undergo a c-section in a subsequent pregnancy are at a higher risk of developing an incisional hernia and women must be counseled regarding this risk.

For women who had only had c-sections the risk of developing an incisional hernia was 0.52 times greater if they had more than or equal to 3 c-sections. However, women who had had more than 3 C-sections had 2.18 times greater risk of developing a paraumbilical

hernia. This could in part be explained by weight gain and multiple gestations as causative factors for development of a paraumbilical hernia.

A review found that 2 out of every 1000 deliveries via c-section required surgery for an incisional hernia, that is for 10 years after a c-section the risk of developing an incisional hernia was 0.197%. This study was conducted in Denmark and thus we must consider that the risk of developing one is higher in Pakistan considering the C-section rate per woman is much higher<sup>14</sup>. Most studies done have focused either on the risk of developing an incisional hernia or on undertaking a simultaneous repair of a paraumbilical hernia at the time of a c-section<sup>15</sup>. Our study finds that C-sections are also a risk factor for developing a paraumbilical hernia later not only incisional hernias. Our study is also the first to find that women who have had normal deliveries and prior to a c-section are at a 4-fold increased risk of developing an incisional hernia.

Thus we find that obesity and multiparity are the root causes of developing ventral hernias in women in Pakistan. Further we find that their socio-economic structure does play an important role in hindering seeking of healthcare services. Women must be counseled regarding the risks of developing ventral hernias by their antenatal care providers and the benefits of family planning re-iterated. Incisional and paraumbilical hernias represent a majority of surgical entities that can be avoided in women in Pakistan if efforts are spearheaded towards counseling for increased birth spacing and decreased pregnancies is done while also explaining the risks of needing surgery for a ventral hernia with multiple gestations later in life. Surgeons and general physicians must encourage women to seek consultations earlier when they develop a ventral hernia to access timely healthcare and surgery.

## CONCLUSION

The high fertility rate and C-section rate in Pakistan incurs a huge risk to women developing ventral hernias and poses a burden to the public healthcare system. Counselling efforts to intimate women regarding the risks of developing these hernias and needing surgery need to be initiated by antenatal care providers. Women must be encouraged and empowered to seek timely consultations with healthcare providers.

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