International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

A Comparison of Chest Expansion in Preop and Postop C-Section Subjects

S. Pooja[1], CH. Venkata Rohitha[2], Dr. M. Suresh Kumar[3], Dr. N. Kavitha[4], Dr. K. Madhavi[5]

[1, 2]BPT INTERNEES, College of Physiotherapy, SVIMS

[3]MPT(CT) Faculty, College of Physiotherapy, SVIMS

[4]MPT(CT) Faculty, College of Physiotherapy, SVIMS

[5]MPT (CT), Ph.D., Principal, College of Physiotherapy, SVIMS

Abstract: ***Chest expansion is a crucial indicator of respiratory function and overall pulmonary health. In the context of caesarean section (C-section) deliveries, understanding changes in chest expansion pre-operatively and post-operatively can provide insights into respiratory recovery and potential complications. Objective: To evaluate the changes in chest expansion in women undergoing C-section before and after the procedure and assess the impact of the surgery on respiratory mechanics. Methods: A prospective study was conducted involving 30 women scheduled for elective C-section. Chest expansion was measured at two points: Pre-operative and 36 hours after the surgery (post-operative). Measurements were taken using a standard tape measure, recording the maximum chest expansion during deep inhalation and the maximum contraction during exhalation. Data were analysed using paired t-tests to determine significant changes in chest expansion. Results: The results showed a statistically significant reduction in chest expansion post-operatively compared to pre-operatively ($p < 0.001$). The reduction in chest expansion was attributed to post-surgical pain, reduced mobility, and diaphragmatic splinting. Conclusion: Caesarean section surgery is associated with a significant decrease in chest expansion immediately following the procedure. This reduction highlights the need for targeted post-operative respiratory care and early mobilization to improve pulmonary function and overall recovery.***

Keywords: Chest expansion, caesarean section, pre-operative, post-operative

1. Introduction

Caesarean section (C-section) is a surgical procedure used to deliver a baby through incisions in the mother's abdomen and uterus. In some cases, C-sections are planned due to medical conditions, while in others, they are done as emergency procedures when complications arise during labor **Horizontal Incision (Pfannenstin Incision):** This incision is associated with a lower risk of significant respiratory issues compared to vertical incisions. It's placed lower on the abdomen and typically does not interfere with the diaphragm or the upper abdominal muscles as much, which helps in maintaining better respiratory function post-surgery. Decreased Functional Residual Capacity (FRC): The functional residual capacity, the volume of air left in the lungs after a normal exhalation, decreases because of diaphragm elevation and increased abdominal pressure. This can lead to a sensation of breathlessness. Diaphragm Elevation: As the uterus expands, it pushes up against the diaphragm, elevating it. This reduces the vertical lung space and can shift the breathing pattern from abdominal to more thoracic (chest) breathing. Increased Respiratory Rate: Pregnant women often experience an increased respiratory rate. This is due to higher oxygen demands from the growing fetus and changes in blood gases.

Pregnant women who have previously undergone a cesarean section (C-section) face several potential complications: uterine rupture, pulmonary embolism, Atelectasis, pneumonia, pleural effusion, Respiratory depression.

Most common reasons for a C-section

Prolonged labour, foetal distress, abnormal fetal positioning (such as breech), and certain maternal health conditions, including high blood pressure or infections like herpes.

Chest Expansion

Chest expansion refers to the ability of the chest to expand and contract during breathing, a critical measure of respiratory function. PREOP: Chest expansion is typically normal/near normal preoperatively POSTOP: Chest expansion may be affected to due factors like pain, immobility and anaesthesia

Aim of the study

A comparison of chest expansion in preop and postop c-section subjects.

Objectives

1) To determine the chest expansion in Pre op c- section subjects using measuring tape in cms
2) To determine the chest expansion in post op c-section subjects using measuring tape in cms.
3) Comparison of chest expansion in Pre op and post op c-section subjects using measuring tape in cms.

2. Methodology

The study was conducted in Padmavathi hospital, Svims on 30 c-section subjects for comparison of chest expansion in pre operative phase and post operative phase. Sampling method was convenience sampling. subjects were enrolled between May 2024 to July 2024. To fulfil the inclusion criteria were included in the study,30 subjects who are

enrolled for c section between May 2024 to July 2024. To fulfil the inclusion criteria were included in the study after obtaining an informed consent.

Outcome Measures:
Chest expansion was measured using inch tape in centimetres.

Chest expansion was measured in 30 c- section subjects both preoperatively and post operatively (36 hours after c-section) at Axillary level and Xiphisternum levels. Measurement were taken using a standard tape measure, recording the maximum chest expansion during deep inhalation and the maximum contraction during exhalation. The data obtained was tabulated and statistically analysed.

Statistical Analysis
The data was analysed using the SPSS version 26 software the data was analysed for normal distribution. The descriptive data was represented as mean and standard deviation. Paired t – tests were used to determine the pre operative and post operative chest expansion. p value of 0.05 was considered as statistically significant

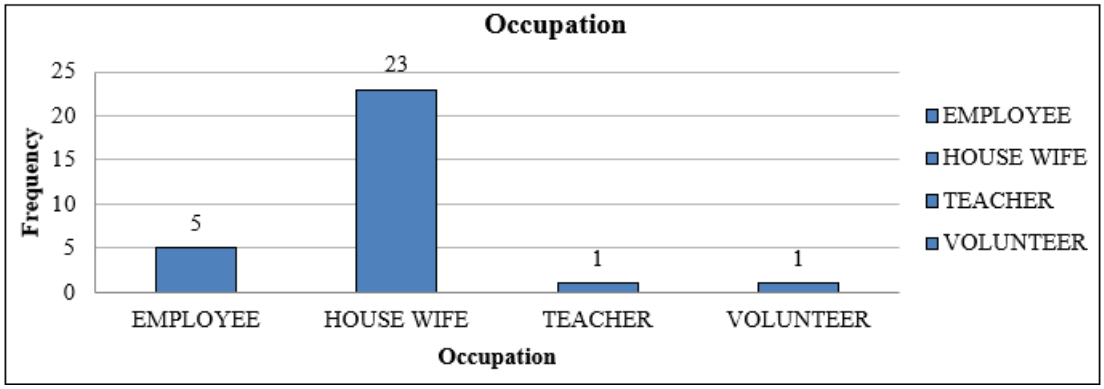
3. Results

Baseline Descriptives

	Mean		Std. Deviation	Variance
	Statistic	Std. Error	Statistic	Statistic
Age (in years)	26.53	.585	3.203	10.257
BMI	24.60	.409	2.238	5.007
Weeks	36.90	.222	1.213	1.472
Axillary inspiration pre	97.53	1.068	5.847	34.189
Axillary expiration pre	94.87	1.032	5.655	31.982
Xiphisternum inspiration pre	97.77	1.385	7.587	57.564
Xiphisternum expiration pre	95.23	1.403	7.682	59.013

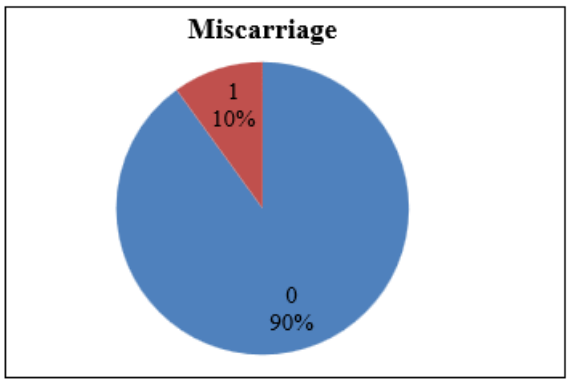
Occupation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Employee	5	16.7	16.7	16.7
	House Wife	23	76.7	76.7	93.3
	Teacher	1	3.3	3.3	96.7
	Volunteer	1	3.3	3.3	
	Total	30	100.0	100.0	



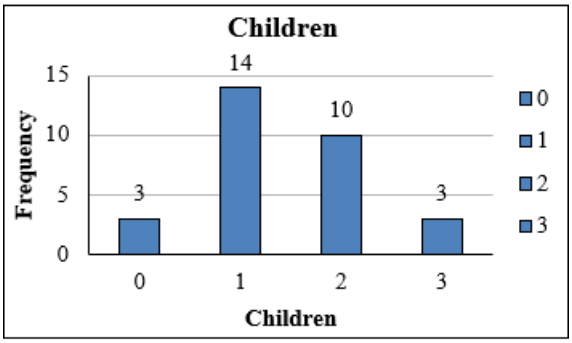
Miscarriage

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	27	90.0	90.0	90.0
	1	3	10.0	10.0	100.0
	Total	30	100.0	100.0	



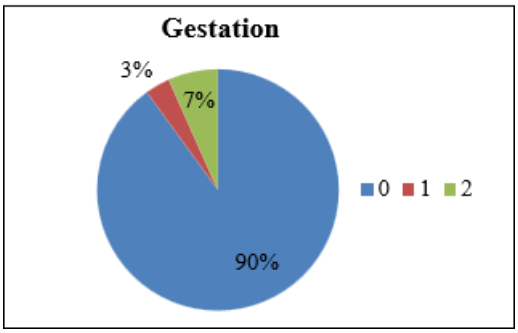
Children

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	10.0	10.0	10.0
	1	14	46.7	46.7	56.7
	2	10	33.3	33.3	90.0
	Total	3	10.0	10.0	



Gestation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	27	90.0	90.0	90.0
	1	1	3.3	3.3	93.3
	2	2	6.7	6.7	100.0
	Total	30	100.0	100.0	

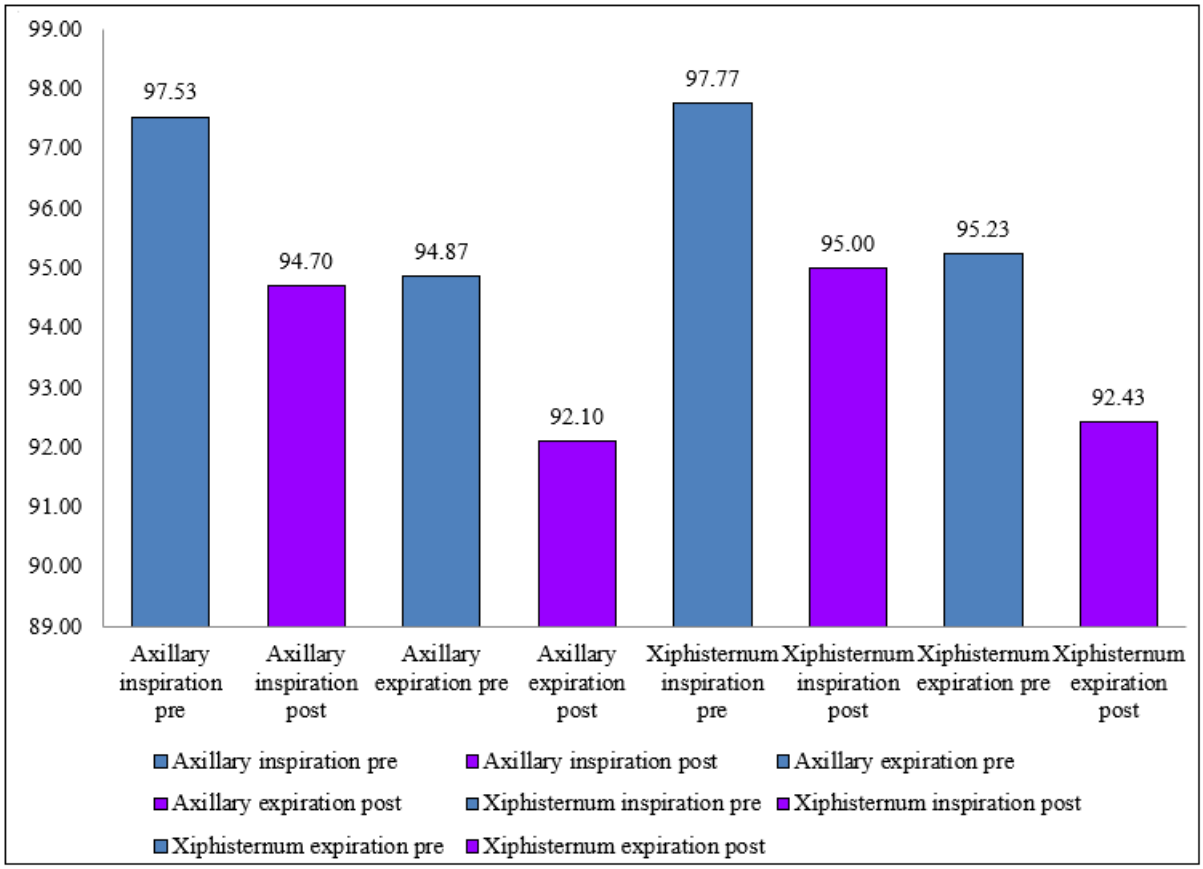


	Shapiro-Wilk		
	Statistic	Df	Sig.
Axillary inspiration pre	0.97	30	0.46
Axillary inspiration post	0.97	30	0.55
Axillary expiration pre	0.97	30	0.55
Axillary expiration post	0.97	30	0.53
Xiphisternum inspiration pre	0.97	30	0.59
Xiphisternum inspiration post	0.97	30	0.58
Xiphisternum expiration pre	0.98	30	0.79
Xiphisternum expiration post	0.98	30	0.74

The results of the Shapiro-Wilk tests indicate that the chest expansion data (both for axillary and xiphisternum measurements, pre- and post-op) are normally distributed. All p-values for both tests are above the significance level of 0.05, suggesting no significant deviation from normality across all variables. Therefore, parametric tests can be appropriately used for further analysis of this data.

Comparison of Chest Expansion in both Preop and Post Op C-Section Subjects

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Axillary inspiration pre	97.53	30	5.847	1.068
	Axillary inspiration post	94.70	30	6.030	1.101
Pair 2	Axillary expiration pre	94.87	30	5.655	1.032
	Axillary expiration post	92.10	30	5.492	1.003
Pair 3	Xiphisternum inspiration pre	97.77	30	7.587	1.385
	Xiphisternum inspiration post	95.00	30	7.358	1.343
Pair 4	Xiphisternum expiration pre	95.23	30	7.682	1.403
	Xiphisternum expiration post	92.43	30	7.890	1.441



Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Axillary inspiration pre - Axillary inspiration post	2.83	1.12	0.21	2.42	3.25	13.89	29	0.000
Pair 2	Axillary expiration pre - Axillary expiration post	2.77	1.57	0.29	2.18	3.35	9.67	29	0.000
Pair 3	Xiphisternum inspiration pre - Xiphisternum inspiration post	2.77	1.23	0.23	2.31	3.23	12.41	29	0.000
Pair 4	Xiphisternum expiration pre - Xiphisternum expiration post	2.80	1.19	0.22	2.36	3.25	12.94	29	0.000

The mean chest expansion values before and after the C-section for both the axillary and xiphisternum measurements (inspiration and expiration) show a decrease post-operation across all comparisons

Axillary Inspiration: Pre-op mean = 97.53, Post-op mean = 94.70
Axillary Expiration: Pre-op mean = 94.87, Post-op mean = 92.10
Xiphisternum Inspiration: Pre-op mean = 97.77, Post-op mean = 95.00
Xiphisternum Expiration: Pre-op mean = 95.23, Post-op mean = 92.43

The standard deviations are relatively consistent, indicating no extreme variability in the data.

Paired Samples Test
The paired t-test results show a statistically significant decrease in chest expansion post-op for all pairs:

Axillary Inspiration: Mean difference = 2.83, t = 13.90, **p = .000**
Axillary Expiration: Mean difference = 2.77, t = 9.66, **p = .000**
Xiphisternum Inspiration: Mean difference = 2.77, t = 12.39, **p = .000**
Xiphisternum Expiration: Mean difference = 2.80, t = 12.93, **p = .000**

Since **p < 0.001** in all cases, the differences between pre- and post-op measurements are highly statistically significant. The confidence intervals also suggest that the true difference is consistently positive (chest expansion is reduced post-op).

There is a significant reduction in chest expansion after the C-section, both at the axillary and xiphisternum levels, for both inspiration and expiration.

The strong correlations indicate that individuals with higher pre-op chest expansion tend to maintain higher post-op values, despite the reduction

4. Discussion

The study explores the changes in chest expansion in women undergoing a Caesarean section (C-section), offering valuable insights into the impact of this surgical procedure on respiratory function. The results show a statistically significant reduction in chest expansion post-surgery, emphasizing the importance of targeted respiratory care in the post-operative period to improve pulmonary function and recovery. Pre-operative and Post-op. The study measured chest expansion at the axillary and xiphisternum levels during both inspiration and expiration, revealing a notable decline in expansion post-surgery.

Previous studies shows in 1972 Moll JMH Wright the verbal instruction during measurement of chest expansion is of importance when measuring by tape. To assess the maximal range of motion in the chest, the patient should be instructed not only to "breathe in/out maximally", but also to "make yourself as big/small as possible"[1]

In 1993, Celli BR Breathing exercises are likely to have a beneficial effect on respiratory muscle strength in patients [11]

In 2013, FC Lanza, respiratory physiotherapy was effective in improving lung function. There were statistically significant differences in measures of respiratory function in the postoperative days, suggesting that preoperative chest physiotherapy expanded the lungs, promoted circulation of air to all pulmonary regions, increased the expiratory volume, improved the movement of the rib cage, and increased vital capacity.[12]

5. Limitations

- The sample size was small as this was an comparative study large sample should be included
- No therapeutic intervention was included in the study

6. Future Recommendations

The future study is recommended with large sample size and use interventional study to evaluate the therapeutic measures on outcomes by assigning participants to compare the chest expansion in pre op and post op c-section subjects

7. Conclusion

In this study conducted on 30 c-section subjects to compare chest expansion in pre op and post op c-section subjects revealed that there is significant decrease in chest expansion post op c-section phase.

References

[1] Moll JMH, Wright V. An objective clinical study of chest expansion. Ann Rheum Dis. 1972; 31:1-8.
[2] Finsbäck C, Mannerkorpi K. Spinal and thoracic mobility age-related reference values for healthy men and women.
[3] Nordisk Fysioterapi. 2005; 9: 136-43.
[4] Malaguti C, Rondelli RR, de Souza LM, Domingues M, Dal Corso S. Reliability of chest wall mobility and its correlation with the pulmonary function in patients with chronic obstructive pulmonary disease. Respiratory Care. 2009; 24:1703-11.
[5] Bennett PH, Wood PHN. Population studies of the rheumatic disease. Excerpta Med Found. 1966; 148: 456.
[6] Hawes MC, Brooks WJ. Improved chest expansion in idiopathic scoliosis after intensive, multi-modality, nonsurgical treatment in an adult. Chest. 2001; 120:672-4.
[7] Clarkson HM. Joint motion and function assessment. Phila-delphia, PA: Lippincott, Williams and Wilkins; 2005.
[8] 7.R. A. P. Fraser, M. L. Hofmeyr, and J. H. A. L. Louw. (2010). "Physiological changes in pregnancy: A review." South African Journal of Obstetrics and Gynaecology, 16(1), 25-28.
[9] This article provides an overview of various physiological changes during pregnancy, including respiratory adaptations.
[10] 8.J. R. Lang, T. M. R. McCormick, and D. C. M. Campion. (2021). "The impact of pregnancy on respiratory physiology." Clinical Obstetrics and Gynecology, 64(3), 436-450.
[11] This paper discusses the changes in respiratory mechanics and gas exchange during pregnancy.
[12] 9.M. J. E. Chapin, E. J. S. Bell, and G. S. McCullough. (2016). "Respiratory physiology in pregnancy." American Journal of Respiratory and Critical Care Medicine, 194(4), 435-443.
[13] This article explores the specific changes in respiratory physiology and their implications for pregnant women.
[14] 10.H. J. Harrison, A. S. Marks, and C. B. Kline. (2015). "Pregnancy and respiratory function." Journal of Maternal-Fetal & Neonatal Medicine, 28(14), 1656-1660.
[15] A detailed examination of how pregnancy affects respiratory function and adaptations necessary for maternal-fetal well- being.
[16] 11.Celli BR. Perioperative respiratory care of the patient undergoing upper abdominal surgery. Clin Chest Med. 1993;14(2):253-61.
[17] 12.FC Lanza *et al.* Chest wall mobility is related to respiratory muscle strength and lung volumes in healthy subjectsRespir Care(2013)