

Research Article

Prevalence of Diastasis Recti and Associated Factors among Women Attending Antenatal and Postnatal Care at Mekelle City Health Facilities, Tigray, Ethiopia

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Abstract

Background: Diastasis recti is the common condition that occurs during pregnancy characterized by separation of rectus abdominis muscle in the midline of linea alba. Discontinuity of rectus abdominis muscle weakens the abdomen and reduces the stability of lumbar spine and pelvis. This results in lumbopelvic pain, prolapse of abdominal organs and weakens the pelvic floor muscles. To date there is scant knowledge on prevalence, and risk factors, of the diastasis recti.

Objective: To assess the prevalence and associated factors of diastasis recti among women attending antenatal and postnatal care at health facilities in Mekelle city, Tigray, Ethiopia.

Methodology: Institutional based cross-sectional study design was conducted. All women who were attending antenatal and postnatal care at the randomly selected hospitals and health centers during the study period were included. Data were collected by trained Nurses with the use of Urogenital Distress Inventory structured questionnaires by interview and physical examination by fingertip width method on 400 numbers of participants. Data were coded, entered, cleaned and analyzed using SPSS version 23. Descriptive statistics and bivariate logistic regression model was done to identify factors associated with the outcome variable. Variables found to have an association with DRA was modeled with multivariate logistic regression to control for the effect of confounders. Multicollinearity was checked by variance inflation factor cutoff point <10.

Results: Among 385 respondents the overall prevalence of diastasis recti was 43.9%. Lumbopelvic pain [AOR: 6.84 (4.014-11.66), 95% CI], parity [AOR: 3.33 (1.86-5.98), 95% CI], caesarean section history [AOR: 1.09 (1.105-7.119), 95% CI], abdominal strength exercise [AOR: 0.12 (0.042-0.364), 95% CI] were statistically significantly associated factors of diastasis recti.

Conclusion: The prevalence of Diastasis Recti Abdominis in pregnant and postpartum women was found to be moderate in Mekelle, Ethiopia and it is associated with major risk factors like, lumbopelvic pain, parity, abdominal strengthening exercise and history of caesarean section.

Keywords: Diastasis recti; Antenatal and postnatal care; Lumbo-pelvic pain; Pelvic floor

Introduction

The Diastasis of Rectus Abdominis (DRA) is defined as the separation or spread of the muscle bundles along the linea Alba [1]. This can vary between a small vertical gap 2 cm to 3 cm wide and 12 cm to 15 cm long, to a space measuring 12 cm to 20 cm in width and extending nearly the whole length of the recti muscle. DRA is often described in relation to pregnancy, but occurs both in postpartum, postmenopausal women and in men [2,3].

The separation occurs frequently during pregnancy, either gradually or suddenly, as a result of exertion imposed on weak

musculature. When the muscles are separated, they cannot work efficiently and contribute to low back and pelvic pain and a flabby appearance [4].

Studies showed that globally, around 90% of mothers have diastasis recti condition and 80% to 85% of women are affected by this condition within their first pregnancy [2]. The study done in developed country showed that varying estimates of incidence of DRA have been reported ranging from 66% to 100% during the third trimester of pregnancy and up to 53% immediately after delivery [4].

The etiology of diastasis recti is not well understood, but Conjecture regarding the cause of the condition suggests that both hormonal changes and mechanical stresses placed upon the structures of the abdominal wall are believed to play an important role in causing the rectus muscle to separate. Other predisposing factors include obesity, multiple pregnancies, a large baby birth, excess uterine fluid, and a lax abdominal wall from former pregnancies.

To date, there is also scant knowledge about risk factors, but factors such as high age, multiparity, caesarean section, and weight gain, high birth weight, multiple pregnancy, ethnicity, and childcare have been proposed [4-6]. It has been claimed that DRA may change posture and give more back strain due to reduced strength and function, leading to low back pain, poor posture, pelvic floor

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problems and gastro-intestinal disturbances like constipation and bloating are symptoms that occur when the support system for the back and abdominal organs is weak connective tissue instead of the muscles [7,8].

Materials and Methods

Study design, area and population

An institutional based cross-sectional study was conducted on a total of 400 Ethiopian pregnant and postpartum women attending antenatal and postnatal care in Mekelle city health facilities, Mekelle, Northern Ethiopia. The study was conducted at randomly selected hospitals (Ayder, Mekelle, kalikidane) and health centers (Semen, Adishimdihun, Kasech). All women who were attending ANC and PNC at the randomly selected health facilities during the data collection period were included in the study. Out of this population those women attending postnatal care who had the longitudinal caesarean section mode of delivery history <1 week duration time period were excluded.

Sample and sampling technique

Sample size was determined by the formula for single population proportions, using the assumption of a 5% level of significance, marginal error of 5%, and 10% non response rate.

A simple random sampling technique was used to select health facilities in Mekelle city from those who provide antenatal and postnatal care to women as health regional bureau report. Systematic random sampling was done to select participants. Hence, $K = (1500/400) = 3.75 \approx 4^{\text{th}}$. Therefore, every 4th woman was recruited based on their coming order after random selection of the first participant by lottery method.

Data collection procedure

After collecting socio-demographic characteristics and obstetric history information from the participants, physical examination was performed to measure the DRA. For physical examination, the women were positioned in supine with hips and knees flexed at 90°, feet supported and arms extended by the side of the trunk. In that position, they were asked to perform a forward trunk flexion until the inferior angle of the scapula was off the bed. The reference points for DRAM measurement was three fingertips breadths (4.5 cm) above and below the umbilicus, and when the trunk was flexed forward, the evaluator placed the finger perpendicularly between the medial edges of the rectus abdominis muscles. The diastasis was graded by the number of fingertips breadths between the medial edges of the rectus abdominis muscles at the reference points. Each finger breadth represented 1.5 cm, as found in the literature [8].

Data quality assurance and data analysis

To ensure the quality of the data, the data collectors and supervisors were trained. The data collection tools were pre-tested on 5% of the total sample size (20) before the actual data collection to check for the accuracy of responses, language clarity, and appropriateness of the tools. Data were coded, entered, cleaned and analyzed using SPSS version 23 software. Descriptive statistics were done for most variables in the study using statistical measurements, like frequency tables, graphs, percentages, means and standard deviations. Bivariate logistic regression analysis was used to determine variables which had an association with diastasis recti abdominals. Variables found to have an association with DRA were modeled with multivariate logistic regression to control for the effect of confounders. Multicollinearity was checked by Variance Inflation Factor (VIF) cut off point <10 [9].

Model fitting was checked using Hosmer and Lemeshow goodness of fit test. Finally, the variables which had significant association were identified on the basis of the odds ratio (AOR), with 95% CI. Ethical approval was obtained from the Mekelle University Ethical Review Committee.

Results

Socio-demographic characteristics of the participants

There were 400 sampled women attending ANC and PNC participated in this study with a response rate of 385 (96.3%) of the total study participants. The majority of the participants 309 (80.3%) were women attending ANC with the mean age of 27.3 ± 5.2 years. The majority of them 281 (73%) was married and 227 (59%) were orthodox. The majority of subjects 211 (54%) were housewife's, 108 (28.1%) were government employee, and 66 (17.1%) were Self employed. The majority of the participants 110 (28.6%) had completed Secondary school (Table 1).

Table 1: Socio-demographic characteristics among women attending antenatal and postnatal care at health facilities in Mekelle city Tigray, Ethiopia, 2018 (n=385).

Variables	Frequency (N)	Percent (%)
Age		
<20	37	9.6
20-30	269	69.8
≥ 30	79	20.6
Occupation		
Housewife	211	54.8
Employed	108	28.1
Self employed	66	17.1
Marital status		
Single	25	6.5
Married	281	73
Divorced	29	6.5
Widowed	15	3.9
Cohabited	35	9.1
Level of education		
Illiterate	45	11.7
Primary	90	23.4
Secondary	110	28.6
College and above	140	36.3
Religion		
Orthodox	227	58.9
Muslim	61	15.8
Protestant	55	14.3
Catholic	39	10.1
Others	3	0.8
BMI		
Underweight	8	2.1
Normal	256	66.5
Overweight	109	28.3
Obese	12	3.1

Obstetric history and other characters of participants

Out of the 385 women participated in this study, the majority of them 238 (61.8%) were Multiparity and 147 (38.2%) of them were primiparity. Among the 309 mothers with ANC follow up, 144 (46.9%) of them were in the 3rd trimester, 103 (33.3%) in the 2nd trimester and 62 (20.1%) of them were in 1st trimester.

Among the 76 mothers with PNC follow up, the majority of them 43 (56.6%) were delivered by spontaneous vaginal delivery (SVD), 18 (23.7%) with instrumental and 5 (19.7%) with cesarean section. Majority of the mothers participated in this study 344 (89.4%) had no history of practice in abdominal strengthening exercise before pregnancy, during pregnancy and after delivery (Table 2).

Table 2: Obstetrics history and other characters among women attending antenatal and postnatal care at health facilities in Mekelle city Tigray, Ethiopia, 2018 (n=385).

Variables	Frequency (N)	Percent (%)
Follow up type		
ANC	309	80.3
PNC	76	19.7
Parity		
Primigravida	147	38.2
Multigravida	238	61.8
Gestational age		
1 st Trimester	62	20.1
2 nd Trimester	103	33.3
3 rd Trimester	144	46.9
Mode of delivery		
SVD	43	56.6
Caesarean section	15	19.7
Instrumental	18	23.7
Weight of the child		
Low	11	14.5
Normal	50	65.8
High	15	19.7
Multiple pregnancies		
No	378	98.2
Yes	7	1.8
Cesarean section history		
No	350	90.9
Yes	35	9.1
History of abdominal surgery		
No	378	98.2
Yes	7	0.8
Abdominal strengthening exercise		
No	344	89.4
Yes	41	10.6
Lumbopelvic pain		
No	240	62.3
Yes	145	37.3
Stress urinary incontinence		
No	370	96.1
Yes	15	3.9
Labor duration		
Normal	54	28.9
Prolonged	22	70.1
Duration after delivery		
≤ 6 months	27	35.5
>6 months	49	64.5

Prevalence of diastasis recti among women attending ANC and PNC

The overall prevalence of diastasis recti among women attending ANC and PNC was 169 (43.9%). The prevalence of the DRA was 37 (48.7%) in women attending PNC and 132 (42.7%) was to ANC. The prevalence of DRA among the mothers, those who practiced abdominal strengthening exercises were 6 (14.6%) and 163 (47.4%) to those who did not practiced abdominal strengthening exercises. The prevalence of the DRA among mothers with stress urinary incontinence was 13 (61.9%) and 156 (42.9%) mothers without stress urinary incontinence. Mothers with Multiparity had higher DRA prevalence 138 (58%) than mothers in primiparity 31 (21.1%). The prevalence of the DRA was 106 (73.1%) among women who had Lumbopelvic pain and those women who had not lumbopelvic pain were 39 (26.9%). Among the mothers, those who had a history of caesarean section, 27 (77.1%) of them develop DRA (Table 3).

In a bivariate logistic regression analysis, diastasis recti were associated significantly with mode of delivery, weight of the baby's,

Table 3: Prevalence of DRA on obstetric history and other characters among women attending antenatal and postnatal care at health facilities in Mekelle city Tigray, Ethiopia, 2018 (n=385).

Variables	Diastasis Recti	
	No	Yes
Follow up type		
ANC	177 (57.3%)	132 (42.7%)
PNC	39 (51.3%)	37 (48.7%)
Parity		
Primigravida	116 (78.9%)	31 (21.1%)
Multigravida	100 (42.0%)	138 (58%)
Gestational age		
1 st Trimester	33 (53.2%)	29 (46.8%)
2 nd Trimester	64 (62.1%)	39 (37.9%)
3 rd Trimester	80 (55.6%)	64 (44.6%)
Mode of delivery		
SVD	28 (65.1%)	15 (34.9%)
Cesarean section	6 (40%)	9 (60%)
Instrumental	10 (55.6%)	8 (44.4%)
Weight of the child		
<2.5 kg	16 (76.2%)	5 (23.8%)
≥ 2.5 kg	23 (41.8%)	32 (58.2%)
Multiple pregnancies		
No	215 (56.9%)	163 (41.1%)
Yes	1 (14.3%)	6 (85.7%)
Cesarean section history		
No	208 (59.4%)	142 (40.6%)
Yes	8 (22.9%)	27 (77.1%)
History of abdominal surgery		
No	214 (56.6%)	164 (43.4%)
Yes	2 (28.6%)	5 (71.4%)
Abdominal strengthening exercise		
No	181 (52.6%)	163 (47.4%)
Yes	35 (85.4%)	6 (14.6%)
Lumbopelvic pain		
No	177 (73.8%)	63 (26.2%)
Yes	39 (26.9%)	106 (73.1%)
Stress urinary incontinence		
No	208 (57.1%)	156 (42.9%)
Yes	8 (38.1%)	13 (61.9%)
Labor duration		
Normal	36 (66.7%)	18 (33.3%)
Prolonged	6 (40%)	16 (60%)
Duration after delivery		
≤ 6 months	12 (44.4%)	15 (55.6%)
>6 months	25 (51%)	24 (49%)
Urine incontinence bothered scale		
Mild	15 (60%)	10 (40%)
Moderate	20 (57.2%)	15 (42.8%)
Sever	182 (56.8%)	138 (43.2%)

parity, age, abdominal strengthening exercise, caesarean section and lumbopelvic pain ($p < 0.05$). However, in multivariate logistic regression analysis, Diastasis recti were significantly associated only with lumbopelvic pain [AOR: 6.8 (4.014-11.66), 95% CI], parity [AOR: 3.3 (1.86-5.98), 95% CI], history of caesarean section [AOR: 2.8 (1.105-7.119), 95% CI], abdominal strengthen exercise [AOR: 0.12 (0.042-0.364), 95% CI] (Table 4).

Discussion

The result of this study found that the prevalence of the DRA was consistent with the other studies done in USA, Hungary, Norway and Portugal, which were (38.5% to 52%) [5,10-12]. This similarity could be due to either from the definition of diastasis recti or inclusion of both ANC and PNC study subjects.

The findings of this study showed that the prevalence of DRA was lower compared to other studies conducted in Brazil, and Chicago, which were (64% to 68%) [6,13]. This difference might be due to the difference in assessment tools of the studies, use of different cut-off values and locations along the linea alba for the presence of DRA which is less cutoff point (1.5 cm) compared to this study. For instance, the study conducted in Brazil showed that more prevalence

Table 4: Multivariate logistic regression analysis among women attending antenatal and postnatal care at health facilities in Mekelle city Tigray, Ethiopia, 2018 (n=385).

Variable	Diastasis Recti		COR (95%)	P-value	AOR (95%)	P-value
	No	Yes				
History of caesarean section						
No	208 (59.4%)	142 (40.6%)	1			
Yes	8 (22.9%)	27 (77.1%)	4.944 (2.183-11.194)*	0	2.804 (1.105-7.119)**	0.03
Parity						
Primigravida	116 (78.9%)	31 (21.1%)	1			
Multigravida	100 (42.0%)	138 (58%)	5.164 (2.219-8.283)*	0	3.33 (1.86 - 5.984)**	<0.001
Abdominal strength exercise						
No	181 (52.6%)	163 (47.4%)	1			
Yes	35 (85.4%)	6 (14.6%)	0.19 (0.78-0.464)*	0	0.124 (0.042-0.364)**	<0.001
Lumbopelvic pain						
No	177 (73.8%)	63 (26.2%)	1			
Yes	39 (26.9%)	106(73.1%)	7.63 (4.79-12.172)*	0	6.8 (2.19 -7.32)**	<0.001

of DRA (68%) among 227 women primiparous and 240 multiparae participants than this study [6]. This could be due to more sample size and more number of multiparae study population. Similarly, the prevalence of DRA was higher on the study done in Chicago [13]. This might be due to inclusion of; only Multiparity study subjects which has a positive correlation with DRA [5], and the measurement using by the dial caliper.

However, it is higher than the studies done in Nigeria, and Turkey which were (25.1%, 24%) respectively [14,15]. This difference might be due to differences in sample size, definition of diastasis recti, criteria of study subjects. A study conducted in Turkey, reported that low prevalence of DRA (24%) was a comparative study with small sample size of 90 postpartum women among primiparous and multiparae. Similarly the study done in Nigeria showed that the prevalence of DRA is lower than this study, the possible reason might be due to the exclusion of women who had a history of any connective tissue diseases; Midline abdominal surgery and Multigravida women.

This study found that being Multigravida of women were more likely to develop DRA compared to Primigravida women [AOR: 3.33; $p < 0.001$]. This result is supported by the study conducted in the USA, and Turkey among pregnant and postpartum women since, positive correlation was established between parity and DRA (OR=0.77; $p < 0.001$) [5,14]. Hence, Multiparity was found to be a risk factor for DRA. The likely explanation suggested that parity itself (the frequency of pregnancies), which may contribute to cumulative mechanical stress on the connective tissue of the abdominal wall and influencing the musculoskeletal morphology of the trunk, increasing the distance between the muscle insertions and producing muscle stretching [6].

This study found that those who had practiced abdominal strengthen exercise were 88% less likely to develop DRA [AOR: 0.12; $p < 0.001$] compared to those who had not practiced abdominal strengthen exercise. This was supported by the study done in Nigeria, since positive correlation was established between abdominal strengthen exercise and DRA ($r = 0.175$; $p < 0.05$). This might be due to the abdominal strength improves the mechanical control of abdomen and its function that contributes to mechanical spine stability through the co-activation of trunk flexors and extensors musculature that helps to decreased abdominal separation [16]. Abdominal muscles are important spinal stabilizers and its poor coordination, as a result of Diastasis of Rectus Abdominis (DRA), may contribute to chronic Low Back Pain (LBP) [17,18].

In this study finding those women who had complained lumbopelvic pain were 6.8 times more likely to develop DRA [AOR: 6.8; $p < 0.001$] than who had not lumbopelvic pain. This is consistent with studies conducted in Hungary and Chicago [10,13]. The possible

explanation might be, it has been claimed that pregnancy may change posture and give more back strain due to reduced strength and function, leading to low back pain and stretching weakness of rectus abdominis muscle that leads to separation from linea alba sheath [19]. However, the study done in Norway that showed no difference in lumbopelvic pain among women with and without DRA [11]. This study found that women who had a history of caesarian section were 2.8 times more likely to develop DRA [AOR: 2.8; $p = 0.03$] than who had not history of ceaserian section. This was supported by the study done in Turkey ($p = 0.004$) [20-25].

Conclusion

In agreement with other studies, this study has found moderate prevalence of Diastasis recti among pregnant and postpartum women. Lumbopelvic pain, parity, abdominal strengthening exercise and history of caesarean section are significantly associated with diastasis recti in Ethiopia. Therefore examination of the diastasis recti could play a vital role in addressing the complications faced by women during their pregnancy.

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