Factors Predicting Variability in Total Small Bowel Length

Dr Muffazal Lakdawala – Sir H. N. Reliance Foundation Hospital and Research Centre, Mumbai, India.

Height

Diabetes

Age

- **I have no potential conflict of interest to report**

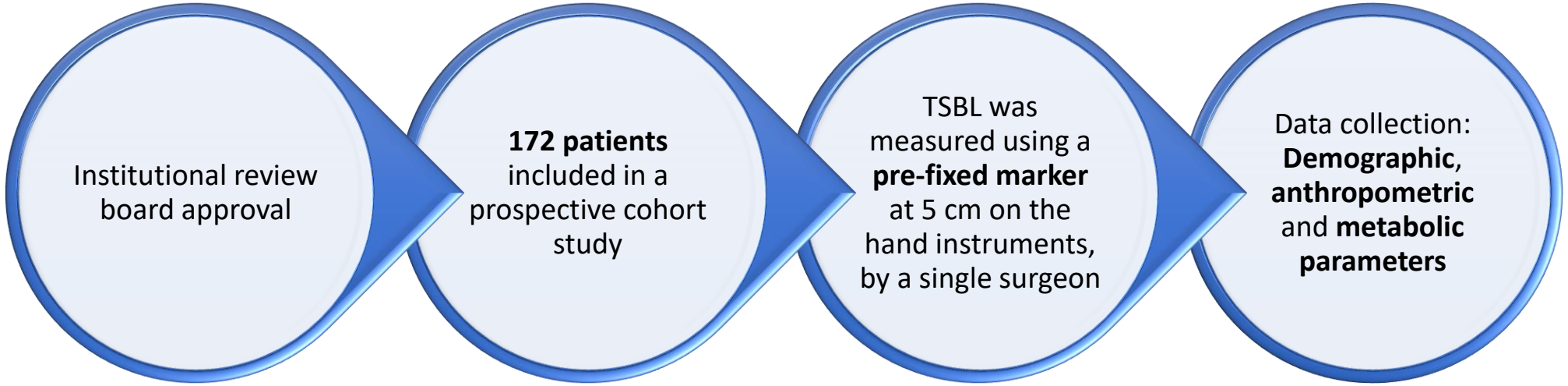
- The small bowel plays a crucial role in the regulation of energy balance and metabolism via nutrient absorption, hormonal regulation, gut microbiota and bile acid metabolism, which together influence obesity.

- Understanding the interplay between the small bowel and mechanisms associated with obesity, coupled with pre-existing comorbid conditions helps tailor surgical approaches to individual patient needs and optimize weight loss and metabolic outcomes.

- It is thus, crucial to know the TSBL of all patients undergoing proximal bypass procedures.

- There is considerable variability in the TSBL reported in literature, and no easy non-invasive method exists to measure TSBL pre-operatively and intraoperative measures are difficult to perform and may lead to bowel injury.

- The present study aims to find the average TSBL in patients undergoing bariatric surgery and correlate it with other select demographic, anthropometric and metabolic parameters.



(The bowel was measured from the antimesenteric border in a stretched fashion)

(Patients who had previous surgery on the small bowel or were undergoing revisional bariatric surgery or had inflammatory bowel disease were excluded from this study)

Results: Demographic and Anthropometric Profile of Study Participants

Factors	Frequency (Percentage)
Sex	
Female	103 (59.88%)
Male	69 (40.12%)
Age (years) [1]	42.60 ± 12.08
Height (cm) [1]	163.56 ± 10.30
Weight (Kg) [1]	124.22 ± 24.99
BMI (Kg/m²) [1]	46.41 ± 7.85
Obesity class	
Class 1	12 (6.98 %)
Class 2	20 (11.63 %)
Class 3	140 (81.40 %)
Note 1: Mean and standard deviation	

The table shows the demographic and anthropometric profile of the study participants

- Of **172** participants, 103 **(59.9%)** were **females**, and 69 **(40.1%)** were **males**
- The **mean age** of the study participants was **42.6 years**
- The **mean height** was **163.6 cm**
- The **mean weight** was **124.2 kg**
- The **mean BMI** was **46.41 kg/m$^{2.}$**

- More than **80%** of the study participants had a **BMI over 40**

Results: Average TSBL Based on Gender and Comorbidities

Covariates	Frequency	Mean	SD	P-value
Sex				**0.004**
Female	103	772.91	117.37	
Male	69	823.55	102.17	
Hypertension				0.557
No	98	788.78	112.95	
Yes	74	799.12	115.79	
Diabetes				**0.005**
No	114	775.83	112.37	
Yes	58	827.41	110.15	
Dyslipidemia				0.057
No	119	782.18	110.97	
Yes	53	818.02	117.72	
Overall	**172**	**793.23**	**113.96**	

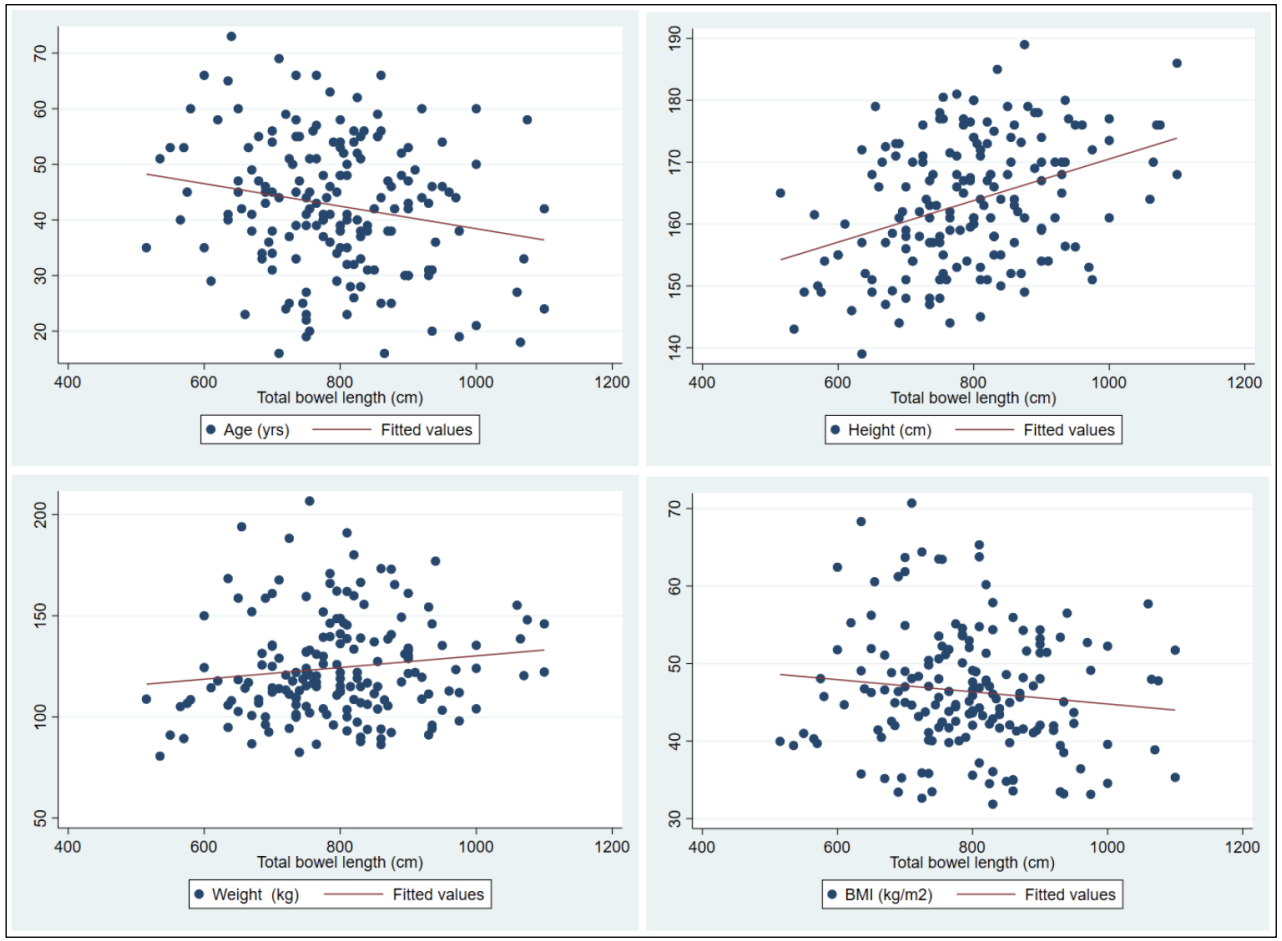
(A multivariate analysis in the form of linear regression was done to predict the variability of TSBL based on selected covariates.)

- Overall, the **mean bowel length** in the study participants was **793.2 cm**
- There was a significant difference in the **mean TSBL of females and males**
- The **mean TSBL for females** was **772.9 cm**, while for **males** it was **823.6 cm**
- There was **no significant difference in the TSBL** based on comorbidities like **hypertension** and **dyslipidemia**
- The **mean TSBL was significantly longer in patients with T2DM** than for non-diabetic individuals

Results: Correlation between Demographic Factors and TSBL

Covariates	Correlation	P-value
Age	-0.191	**0.012**
Height	0.372	**0.000**
Weight	0.131	0.086
BMI	-0.114	0.137

- The table shows the **correlation** between **demographic factors and TSBL**
- **Age** was seen to be negatively correlated with TSBL (r= -0.19)
- **Height** was seen to be **positively correlated with TSBL** (r= 0.37)



Scatterplot of TSBL with Age, Height, Weight, and BMI

Results: Unadjusted and Adjusted Variation in TSBL based on Selected Demographic Factors and Comorbidities

Total Bowel Length	Unadjusted Coefficient	Adjusted Coefficient
Age	**-1.79** * (-3.20, -0.40)	**-1.66** * (-3.04, -0.28)
Sex	**50.64** * (16.39, 84.89)	-38.48 (-87.34, 10.38)
Height	**4.11** * (2.56, 5.67)	**4.88** * (2.50, 7.25)
Weight	0.60 (-0.08, 1.28)	NA
BMI	-1.65 (-3.84, 0.53)	NA
Diabetes	**51.58** * (16.04, 87.12)	**62.22** * (27.87, 96.57)
Hypertension	10.35 (-24.37, 45.06)	NA
Dyslipidemia	35.83 (-1.03, 72.70)	NA
Constant	**NA**	**60.54**
Note: *: p-value<0.05		

- The table shows the **unadjusted and adjusted variation in TSBL** based on selected **demographic factors**, **anthropometric factors** and **comorbidities**
- **Unadjusted linear regression** established that **age**, **sex**, **height**, and **diabetes** could **statistically significantly predict TSBL** (p-value < 0.05)
- However, **after adjusting for other significant factors**, *sex was not seen to be able to statistically significantly predict TSBL* (p-value > 0.05)
- These **factors** accounted **for approximately 20% of the explained variability in TSBL**

Comparison with other studies

Author/ Study	Study population	Average TSBL (cm)	Correlation with			
			Age	Sex	Height	Weight
Lakdawala (2024) / Present Study	Both	793.2 cm	Yes	-	Yes	No
	Male	823.6 cm				
	Female	772.9 cm	Negative Correlation		Positive correlation	
Treves (1885)	Male	832.5	No	-	No	No
	Female	790.9				
	Female	711				
Dreike (1894)	Both	582	-	-	-	-
	Male	637				
	Female	527				
Bryant (1924)	Both	625	Yes	-	-	-
	Male	663				
	Female	587	Negative Correlation			
Backman (1974)	Both	718	-	-	-	-
	Male	761				
	Female	675				
Guzman (1977)	Both	525.5	-	-	-	-
	Male	546				
	Female	505				
Underhill (1995)	Both	615	No	-	Yes	-
	Male	638				
	Female	592			Positive correlation	
Nordgren (1997)	Both	564	No	-	Yes	Yes
	Male	591				
	Female	534			Positive correlation	Positive correlation
Hounnou (2002)	Both	634.9	Yes	-	No	Yes
	Male	670.7				
	Female	599.2	Negative			Positive
			Correlation			correlation
Valera-Mora (2005)	Both	671	-	-	-	-
Hosseinpour (2008)	Both	459.6	No	-	No	No
	Male	452.2				
	Female	468.2				
Hernández-Martínez (2011)	Both	600	-	-	-	-
Nergaard (2014)	Both	620	-	-	-	-
Teitelbaum (2013)	Both	506	Yes	Yes	Yes	No
	Men	533				
	Female	482	*Negative in Female	Positive in Male		
			Positive in Male			
Bekheit (2019)	Both	630	No	-	Yes	Yes
	Male	661.5				
	Female	612			Weak Positive correlation	Weak Positive correlation

- indicates not studied

* Teitelbaum reported a correlation between age and TSBL [Male (r = 0.17; P = 0.08), Female (r = -0.18; P = 0.04)]

- A lot of variability in the total length of the small bowel can be seen in existing literature
- The present study concludes that **age**, **height**, and **diabetes** were the factors that were found to **significantly predict TSBL in Indian people with obesity**
- With **increasing age, TSBL was seen to become shorter**
- On the other hand, **tall individuals were seen to have longer TSBL**
- Those **patients with T2DM** also had a **longer average TSBL**

The results suggest that **while deciding the BP limb length in proximal bypass surgeries** it is crucial to remember to keep –

- ✓ ***the BP limb length shorter*** *in the case of* ***older and shorter individuals*** *to prevent protein-energy malnutrition, steatorrhea, etc.*
- ✓ ***the BPL length should be appropriately increased*** *in the case of* ***younger, taller, and diabetic patients***

to achieve significant, sustained weight loss, and remission of metabolic syndrome


IFSO
Asia Pacific Chapter
OSSI
Obesity & Metabolic
Surgery society of India
9th IFSO APC | 22nd OSSICON
Meeting
20-22 February 2025 | Mumbai, India, Jio World Convention Centre
Save the Date
mumbai
2025
ifsoapc2025.com