Motivation for reproducing the analysis.

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More details at https://github.com/apg1997/NFHS_AbdominalObesity

This note refers to *Chaudhary M, Sharma P. Abdominal obesity in India: analysis of the National Family Health Survey-5 (2019–2021) data. The Lancet Regional Health - Southeast Asia 2023; 14: 100208*.

The paper contains numerous issues with the interpretations of the results, frequent repetitions, unsubstantiated assertions, and incorrect use of causal language. While we do not explicitly comment on the use of language, the paper's use of phrases like "generally", "tend to", and "attributed to" is incorrect and adds vagueness. In this note, we have highlighted issues in the methods, results, and discussion sections.

Text in the shade of red is excerpt from the paper.

Methods

The methods section is sparse (half a page), with crucial details on the justification for choices made and the analytical approach missing, which could have repercussions on inference. In addition to those listed below, the paper does not mention using a complex survey design with appropriate survey weights for analysis.[1,2] Further, it is unclear from either description of methods or Stata output in the two supplementary files if the *svyset* suite of commands (necessary for this data) in Stata were used. While there are varying views on the use of sampling weights in regression analysis, not mentioning the use or lack thereof creates vagueness for the reader.[3]

The discussion section of the article stretched over two pages, but it failed to discuss the critical methodological considerations around the cutoff standard and different recommendations, age groups in the study population, and sensitivity analyses.

Choice of waist circumference cutoffs

The cutoffs for waist circumference to define abdominal obesity used in the paper are more than 80 cm and 94 cm in women and men, respectively, attributed to a WHO recommendation. The paper reads:

> "Over the last three decades, multiple studies worldwide have raised awareness about abdominal obesity. In 1997, the WHO acknowledged the significance of abdominal obesity and proposed using indicators such as waist circumference to identify populations at a higher risk of abdominal obesity.[5] Abdominal or central obesity is defined as having a waist circumference of more than 80 cm in women and more than 94 cm in men."

As stated in the cited report[4] (Annex A, pp.27, reference 5 in the paper), these are "not WHO recommendations" but merely an example cutoff (see the report excerpt below). On

the contrary, the recommendation of this report identified challenges in designating a universal cutoff and laid out principles for arriving at cutoffs.

> Based on these two WHO reports, the recommendations often attributed to WHO are shown in Table A1 although those sex-specific cut-off points cited in the report of the WHO Expert Consultation on Obesity (2000b) were an example only and not WHO recommendations.

Table A1 World Health Organization cut-off points and risk of metabolic complications

Indicator	Cut-off points	Risk of metabolic complications
Waist circumference	>94 cm (M); >80 cm (W)	Increased
Waist circumference	>102 cm (M); >88 cm (W)	Substantially increased
Waist–hip ratio	≥0.90 cm (M); ≥0.85 cm (W)	Substantially increased

M, men; W, women

There are multiple abdominal waist circumference criteria used in India. For example, NFHS-5 reports[5] (see the table header for Rajasthan below, pp.144) uses the same criteria as the paper for "increased risk of metabolic complications" while designating even higher cutoffs for "substantially increased risk".

Table 79 Waist circumference and waist-to-hip ratio

Among women and men age 15-49, percentage with specific waist circumferences and waist-to-hip ratios, by background characteristics, Rajasthan, 2019-21

	Women						Men					
	Waist circumference			Waist-to-hip ratio			Waist circumference			Waist-to-hip ratio		
Background characteristic	Normal	Increased risk of metabolic complications (>80 cm)	Substantially increased risk of metabolic complications (>88 cm)	Normal	Substantially increased risk of metabolic complications (≥0.85)	Number of women	Normal	Increased risk of metabolic complications (>94 cm)	Substantially increased risk of metabolic complications (>102 cm)	Normal	Substantially increased risk of metabolic complications (≥0.90)	Number of men

Recent papers have used lower cutoffs for both adult men (≥90 cm instead of >94cm) and adult women (≥80 cm instead of >80cm).[6,7] The reasoning for lower cutoffs is increased cardiovascular risk at lower levels of waist circumference.[8]

Surprisingly, the authors use higher cutoffs without giving any rationale for their preferred cutoff and do not acknowledge the different cutoffs used in the literature.

Choice of BMI cutoffs

There is no justification for the choice of BMI cutoff either — mentioned for the first time in the first paragraph of the *Results* section.

> "Individuals with BMI >25 were considered as overweight and those with BMI >30 were considered as obese."

Further, the reason for presenting results for different BMI cutoffs (≥25 kg/m^2) in the results text, and Table 1 and Table 2 is unclear. Likely a typo but this needs correction.

Obesity parameter
Waist circumference >80 cm for women and >94 cm for men
BMI ≥ 25

***Table 1*: Prevalence of BMI and WC - a comparison.**

Table 2 header

S.No.	Background characteristics	Women		Men	
		WC > 0.80 cm (95% CI) N	BMI ≥ 25 (95% CI) N	WC > 0.94 cm (95% CI) N	BMI ≥ 25 (95% CI) N

Similar to waist circumference cutoffs, there are recommendation to use lower cutoffs for defining obesity than those recommended by the WHO (used in this paper; 25-29.9 kg/m^2 for overweight and ≥30 kg/m^2 for obese) given the higher risk of comorbidities at lower levels of BMI. See the table below from "The Asia-Pacific perspective: redefining obesity and its treatment."[8]

Table 2.3. Co-morbidities risk associated with different levels of BMI and suggested waist circumference in adult Asians

Classification	*BMI (kg/m^2)*	*Risk of co-morbidities*	
		Waist circumference	
		< 90 cm (men) *< 80 cm (women)*	*≥ 90 cm (men)* *≥ 80 cm (women)*
Underweight	*< 18.5*	*Low (but increased risk of other clinical problems)*	*Average*
Normal range	*18.5-22.9*	*Average*	*Increased*
Overweight:	*≥ 23*		
At risk	*23-24.9*	*Increased*	*Moderate*
Obese I	*25-29.9*	*Moderate*	*Severe*
Obese II	*≥ 30*	*Severe*	*Very severe*

Recent papers have used these lower cutoffs for defining obesity, with another paper using NFHS data reporting results based on both cutoffs.[9,10] The choice of cutoffs, the missing

justification for this choice, and the absence of any discussion on the multiple cutoffs used in contemporary literature are surprising.

Age groups included in the study

The study population includes women and men in the 15 to 49 years age group. The waist circumference and BMI criteria used for the study are prescribed for adults (18 and older). For adolescents and children, the recommendation is to use age-specific cutoffs for defining obesity instead of universal cutoffs.[11–14] The study should only include individuals 18 or older in the analysis.

Further, the study does not specify whether they exclude pregnant women and women in the postpartum phase from their study population because these cutoffs do not apply to women in these life stages. The results should be revised in case they are included in the analysis.

Size of the study population

The methods specify that "NFHS 5 data on the waist circumference of 659,156 women and 85,976 men, when treated for outliers at 3 SD, has reduced to 655,328 women and 85,377 men, respectively." The rationale for excluding 0.58% of women and 0.7% of men from the NFHS sample is unclear. The paper should present a sensitivity analysis without excluding these individuals.

The calculation for the number of individuals included in the analysis using BMI cutoff is unclear. It cannot be the same calculation as the waist circumference analysis because the numbers differ (see *N* in Table 1).

Obesity parameter	Women (%) (95% CI)	N	Men (%) (95% CI)	N
Waist circumference >80 cm for women and >94 cm for men	39.6 (39.5–39.7)	655,328	11.9 (11.7–12.1)	85,377
BMI ≥ 25	23 (22.9–23.1)	649,421	22.1 (21.8–22.3)	84,925

Table 1: Prevalence of BMI and WC - a comparison.

The rationale for combining levels

The analysis presents two levels for *Type of diet*: "Vegetarian/Occasionally non-vegetarian" and "Non-vegetarian", whereas the NFHS data records the levels as "never", "occasionally", "weekly" and "daily". The reasoning for this choice is unclear.

We use the original encoding of the data in our model. While the estimated effects are similar, there are nuances in the interpretation of the analysis. Firstly, the estimates are not causal since the empirical strategy used does not account for all the confounders. Secondly, we do not see a dose-response relationship in the relationship between meat consumption and abdominal obesity, which suggests that non-vegetarianism is not a determinant of abdominal obesity — important in the Indian context where vegetarianism is often associated with belonging to socially privileged caste groups.[15]
In comparison, the choice for combining levels in the *Religion* variable is clear because religions with small or zero values have been clubbed under *Others.*

Supplementary files

While essential methodological details are missing in the manuscript for reasons unknown, the Stata output in the two supplementary files has further reduced our confidence in the analytic rigour.

The *1-s2.0-S2772368223000689-mmc2* file:
While this is specified as a "Multilevel Logistic regression", this is not a multilevel model because no levels are specified in the *melogit* command (details in the next point). Further, the model is meaningless because categorical variables are treated as continuous.

```
. melogit wc catage v025  v106 caste  religion  v190 veg_noveg, or

Iteration 0:   log likelihood = -370750.09
Iteration 1:   log likelihood = -370741.05
Iteration 2:   log likelihood = -370741.05

Logistic regression                             Number of obs     =    632838

                                                Wald chi2(7)      =  79426.26
Log likelihood = -370741.05                     Prob > chi2       =    0.0000
```

wc	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
catage	2.016938	.0064381	219.79	0.000	2.004359	2.029596
v025	.9063898	.0064964	-13.71	0.000	.8937461	.9192125
v106	1.094291	.0036931	26.70	0.000	1.087077	1.101553
caste	1.054813	.0027842	20.22	0.000	1.04937	1.060284
religion	1.084994	.0028824	30.71	0.000	1.079359	1.090658
v190	1.37313	.0035409	122.97	0.000	1.366208	1.380088
veg_noveg	1.15245	.0065839	24.84	0.000	1.139618	1.165427
_cons	.0264398	.0005711	-168.19	0.000	.0253438	.0275831

The *melogit* in Stata models Multilevel mixed-effects logistic regression (https://www.stata.com/manuals/memelogit.pdf). For survey data, the model specification should specify svyset and svy with primary (psu) and secondary sampling unit (ssu). The same model can be achieved with other syntax but not without specifying psu and ssu (and levels for melogit to fit a multilevel model). The code presented in the supplementary files does neither.

[From the help file for melogit]
Same as above, but svyset data first
svyset psu, weight(wvar3) || ssu, weight(wvar2) || _n, weight(wvar1)
svy: melogit y x || psu: || ssu:

The two (of the 3) models presented in the supplementary files appear to have same specification (also incorrectly specified as multilevel), but their results are different (different log likelihood with same number of observations in the model, different estimates with the largest difference in red box.)

1-s2.0-S2772368223000689-mmc2

```
. melogit wc i.catage i.v025  i.v106 i.caste  i.religion  i.v190 i.veg_noveg, or

Iteration 0:   log likelihood = -366988.94
Iteration 1:   log likelihood = -366445.25
Iteration 2:   log likelihood = -366442.88
Iteration 3:   log likelihood = -366442.88

Logistic regression                             Number of obs     =     632838

                                                Wald chi2(22)     =   81759.42
Log likelihood = -366442.88                     Prob > chi2       =     0.0000
```

wc	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
catage						
20-29yrs	3.175267	.035121	104.46	0.000	3.107172	3.244855
30-39yrs	7.208816	.0798389	178.35	0.000	7.054021	7.367008
40-49yrs	10.15557	.1185289	198.61	0.000	9.925896	10.39056
v025						
rural	.8978614	.0065914	-14.68	0.000	.885035	.9108737
v106						
primary	1.169153	.011592	15.76	0.000	1.146653	1.192095
secondary	1.255329	.0101501	28.12	0.000	1.235592	1.275382
higher	1.22089	.0137677	17.70	0.000	1.194202	1.248175
caste						
Schedule Tribe	.6828191	.0071165	-36.61	0.000	.6690125	.6969107
Other backward class	.9147291	.0071823	-11.35	0.000	.9007598	.9289151
Other	1.119087	.0103979	12.11	0.000	1.098892	1.139654
Don't know	1.007129	.0377795	0.19	0.850	.9357388	1.083965
religion						
Muslim	1.372595	.0133843	32.48	0.000	1.346611	1.39908
Christian	1.236087	.0157102	16.68	0.000	1.205675	1.267265
Sikh	1.94748	.0375795	34.54	0.000	1.875201	2.022545
Budhhist	1.257433	.0322959	8.92	0.000	1.195701	1.322352
Jain	.6884521	.0574637	-4.47	0.000	.5845554	.8108152
Others/No religion	1.708036	.043606	20.97	0.000	1.624673	1.795677
v190						
poorer	1.464666	.0137799	40.56	0.000	1.437905	1.491925
middle	1.901562	.0183484	66.60	0.000	1.865937	1.937866
richer	2.430719	.0251077	85.99	0.000	2.382003	2.480431
richest	3.30482	.0392534	100.64	0.000	3.228773	3.382658
veg_noveg						
Nonveg	1.159879	.0068848	24.99	0.000	1.146463	1.173452
_cons	.0590492	.0009388	-177.97	0.000	.0572376	.0609181

1-s2.0-S2772368223000689-mmc1

```
Logistic regression                             Number of obs     =     632838
                                                LR chi2(22)       =  107193.21
                                                Prob > chi2       =     0.0000
Log likelihood = -368175.97                     Pseudo R2         =     0.1271
```

wc	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
catage						
20-29yrs	3.195866	.0345273	107.54	0.000	3.128905	3.264259
30-39yrs	7.137738	.0775497	180.90	0.000	6.98735	7.291362
40-49yrs	10.15942	.1165882	202.02	0.000	9.933457	10.39051
v025						
rural	.8846136	.0061418	-17.66	0.000	.8726574	.8967337
v106						
primary	1.172383	.0116439	16.01	0.000	1.149782	1.195429
secondary	1.237878	.0101117	26.12	0.000	1.218217	1.257856
higher	1.205546	.0133779	16.85	0.000	1.179609	1.232053
religion						
Muslim	1.280973	.0120302	26.37	0.000	1.25761	1.30477
Christian	1.375776	.0257935	17.02	0.000	1.326139	1.42727
Sikh	2.028657	.0466922	30.73	0.000	1.939176	2.122268
Budhhist	.5520775	.0201656	-16.26	0.000	.5139353	.5930506
Jain	.6981261	.0473332	-5.30	0.000	.6112545	.7973439
Others/No religion	.9863899	.051554	-0.26	0.793	.8903491	1.092791
caste						
Schedule Tribe	.6030128	.0071046	-42.93	0.000	.5892475	.6170997
Other backward class	.9336378	.0069574	-9.21	0.000	.9201008	.9473741
Other	1.104123	.0097762	11.19	0.000	1.085127	1.123451
Don't know	1.006544	.0336711	0.19	0.845	.942667	1.07475
v190						
poorer	1.412088	.0139246	34.99	0.000	1.385058	1.439645
middle	1.843469	.0183124	61.57	0.000	1.807924	1.879712
richer	2.341492	.0245678	81.09	0.000	2.293832	2.390142
richest	3.098994	.0367201	95.46	0.000	3.027854	3.171807
veg_noveg						
Nonveg	1.270993	.0074734	40.78	0.000	1.25643	1.285725
_cons	.0626223	.0009719	-178.52	0.000	.0607461	.0645564

Manuscript text: results

Repetitions in the manuscript

There are multiple repetitions throughout the manuscript. We have sampled a few below.

Definition of abdominal obesity

1. "Abdominal or central obesity is defined as having a waist circumference of more than 80 cm in women and more than 94 cm in men." [Introduction, pp.2]
2. "The abdominal obesity has been defined as waist circumference of more than 80 cm in women and of more than 94 cm in men" [Methods, pp.3]
3. "For women, a waist circumference >80 cm, and for men, waist circumference >94 cm was considered as abdominal obesity." [Results, pp.3]

Repetitions in Results

Exhibit A: pp.3

"The demographic segregation of data depicts that compared to women (39.6%), the prevalence of abdominal obesity was lower in men (11.9%)."

Repeated in the next paragraph:
"The preliminary finding on the status of abdominal obesity reveals that 40% of women and 12% of men are abdominally obese in the country."

Repeated again in the same paragraph:
"The prevalence of abdominal obesity among women in India is quite high, with about 4 in 10 women having a waist circumference higher than the prescribed cutoff mark for abdominal obesity."

Partially repeated in the same paragraph:
"The preliminary finding on the status of abdominal obesity reveals that 40% of women and 12% of men are abdominally obese in the country. It is found that the 22.1% of men tend to have BMI above the cutoff range and 11.9% of them have a WC above the cutoff range. For women it is found that 23% of women have BMI above the cutoff range of 25 and 39.6% of women have WC above the cutoff range of 80 cm."

The waist circumference numbers are repeated again. Further, "11.9% of them" is incorrectly phrased. The denominator for 22.1% (84,925) and 11.9% (85,377) are different (see N for Men in Table 1). A similarly phrased statement in the discussion section on pp.8 is also incorrect: "As per NFHS-5 data, about 24% of the women from scheduled tribes have high waist circumference, and *12% of these women* have high BMI."

Exhibit B: pp.3

"Abdominal obesity is a significant health concern for women in India, as many women with a healthy BMI still have excess abdominal fat, which increases their risk of metabolic diseases and other health complications."

Repeated in the next line:
"The prevalence of abdominal obesity among women in India is quite high, …, *which puts them at an increased risk of metabolic complications and noncommunicable diseases*."

Exhibit C: pp.3

"The prevalence of abdominal obesity is (W-56.7% ± 0.2, M19.7% ± 0.5) in the adults belonging to the age group of 40–49, which is higher than those in the age group of 20–29 years (W-32.2% ± 0.2, M-7.4% ± 0.3)."
Repeated in the next line:
"The older adults tend to be more obese than the younger ones."

Interpretation of the results

"More women are found to be obese in Southern states of Kerala (65.4%) and Tamil Nadu (57.9%) and northern states of Punjab (62.5%) and Delhi (59%)"
This is incorrectly phrased because the estimate does not indicate absolute count but just proportions.

"Prevalence of abdominal obesity (as depicted by Table 2) for people residing in urban areas [women (W)49.5% ± 0.2, men (M)-15.7% ± 0.4)] is higher than in those in rural areas (W-35% ± 14, M-10% ± 0.24)."
Decimal is missing in "± 14".

"It is interesting to note that amongst the religious groups the prevalence was found to be less in the Buddhist (31.6% ± 1.4) and Jain women (43.1% ± 2.7) and was found to be more in the Sikh (61.8% ± 0.96) and the Christian women (48.1% ± 0.78). But the difference was not very pronounced in men."
The authors cherry pick the results in this paragraph while making a vague statement on men's estimates disaggregated by religion (see the excerpt from Table 2 below). For instance, the difference in estimates for Sikh men (21.1%) and Muslim men (9.6%) is of considerable size. As for women, we are unsure of the choice to ignore the estimates for Hindu and Muslim women.

S.No.	Background characteristics	Women				Men			
		WC > 0.80 cm (95% CI)	N	BMI ≥ 25 (95% CI)	N	WC > 0.94 cm (95% CI)	N	BMI ≥ 25 (95% CI)	N
4	**Religion**								
	Hindu	38.3 (38.2–38.5)	536,425	22.3 (22.2–22.4)	531,741	12 (11.8–12.2)	67,900	22.1 (21.7–22.4)	67,539
	Muslim	44.1 (43.8–44.5)	85,730	24.9 (24.6–25.2)	84,897	9.6 (9.1–10.1)	13,115	20.2 (19.5–20.9)	13,039
	Christian	48.1 (47.3–48.8)	15,437	29.8 (29.1–30.6)	15,222	16.9 (15.5–18.6)	2250	27.8 (25.9–29.7)	2234
	Sikh	61.8 (60.8–62.7)	9864	37.5 (36.5–38.5)	9732	21.1 (18.3–24.3)	729	27.7 (24.6–31.1)	725
	Buddhist	31.6 (30.2–33.1)	4142	20.2 (19–21.5)	4123	17.9 (15.6–20.5)	929	27.2 (24.4–30.1)	936
	Jain	43.1 (40.4–45.8)	1263	29.8 (27.3–32.4)	1247	17.6 (13.1–23.3)	218	22.6 (17.5–28.6)	217
	Others	25.6 (24–27.4)	2468	13 (11.7–14.4)	2460	15.2 (11.2–20.4)	237	34.3 (28.6–40.6)	236

"The women who attained higher education (W-45.1% ± 0.3, M-15.9% ± 0.5) were more obese compared to men with the higher education." [Results, pp.5]
Based on Table 2, this is incorrect. Instead of "more obese" and a direct comparison of women and men, the Table 2 results show the proportion of individuals who are obese within the respective education strata.

"Women who consumed non-vegetarian diet (42.4% ± 0.16) had more of abdominal obesity than women who consumed vegetarian food or take an occasional non-vegetarian diet (36.4% ± 0.17). However, this difference in abdominal obesity for the diet type or level of education was not evident in men" [Results, pp.5]
We disagree with the latter statement on men's estimates. For both diet type and level of education, the confidence intervals do not overlap for several strata within each category, clearly indicating a difference.

"*We found that the abdominal obesity in women sets in during age 30–49 years*. When women reached the age of 20–29 years, 32.2% of the women were found to be abdominally obese. The prevalence of abdominal obesity increases to 49.3% of women during age 30–39 years and 56.7% of women are abdominally obese during age 40–49 years. As per the BMI measure, 16.3%, 30.7% and 35.5% of women are overweight during age 20–49 years. *There is a tendency to acquire abdominal obesity much easier than the general obesity, as women age*." [Results, pp.5, emphasis added]
The text in italics infer much more than the results of this analysis can possibly indicate. The results for different age groups have also been presented on pp.3 (right column, second-last paragraph).

"Jharkhand state has highest proportion (65%) of poor households in the country in the NFHS-5 survey sample, while more than three-fourth of population in Kerala and Punjab belongs to the richer section in the survey sample.[20] This indicates that economic prosperity differentials amongst Indian states, rather than the geography, is a marker for abdominal obesity. However, other factors like cultural diversity, food habits, and status of physical activity across states also need to be studied further." [Results, pp.6]
This is an incorrect conclusion. The authors have cherry picked results from the adjusted model in Table 3. Further, it is unclear if the adjusted models specified geography.

"There is evidence to suggest that religious groups may reflect the combined effects of cultural practices, economic conditions, livelihoods, and dietary preferences on obesity. However, it is important to note that the relationship between religion and obesity is complex and multi-factorial. Factors such as genetics, age, gender, and socioeconomic status can also play a role in the development of obesity. To better understand the relationships between religious beliefs, lifestyle factors, and abdominal obesity, further research is needed across different religious groups in the country. This may involve examining dietary habits, physical activity levels, and other lifestyle factors in different religious communities, as well as exploring the cultural and social factors that contribute to these behaviours." [Results, pp.5, emphasis added]
The authors provide no evidence in making baseless assertions. In the statement, "Factors …", the authors have conflated concepts of social determinant of health with biological basis of health. There is repetition again in the last two sentences.

“Education is not a defining factor for abdominal obesity in women.” [Results, pp.6]
This is opposite of the results displayed in Table 3. The odds of abdominal obesity amongst women are higher in women with education compared to those with no education.

“The sample size of NFHS-5 is large, and the prevalence of abdominal obesity was found to be high in specific socio-economic groups. When examined for association of socioeconomic groups with abdominal obesity, the results are concurrent with prevalence statistic.” [Results, pp.6]
It is unclear which concurrence are the authors referring to. On its own, the latter statement has no meaning, and the former has been repeated over and over throughout the results section.

“Given the vast geography, heterogeneous habitat, and immense cultural diversity in India, conducting extensive research on the patterns and key drivers of abdominal obesity and their mutual interactions is essential. Such research can help identify effective interventions to prevent and treat abdominal obesity in different populations, considering the unique cultural, economic, and regional factors that contribute to this condition. The NFHS 5 data showing a diverse pattern of abdominal obesity across age, social and economic segregations highlights the need for further research on the underlying factors contributing to this trend. To better understand these factors, it is important to conduct studies that examine dietary practices, lifestyle variables, genetic structures, and their interactions among different age groups, urban and rural populations, wealthy and non-wealthy sections, and male and female populations in India. Moreover, regional, cultural, and economic dimensions also play a crucial role in determining the key drivers of abdominal obesity for various sections of society in India. Therefore, it is necessary to explore the unique cultural, economic, and regional factors that contribute to abdominal obesity among different groups in the country.”
[Results, pp.6]
This is repetition as the statements in this paragraph have been made in the results section earlier. Further, this, along with several other paragraphs in the results section, are more suitable for the discussion.

Manuscript text: discussion

Discussion is likely the longest section of the paper. In addition to the discussion section itself, text most suited for discussion is peppered throughout the paper, particularly in the results section. Two examples are highlighted below:

> "Kerala, Tamil Nadu, Punjab, and Delhi are generally considered to be more economically developed states in India compared to Jharkhand and Madhya Pradesh, which are relatively less developed. This is reflected in various socioeconomic indicators such as per capita income, human development index, literacy rate, and access to basic amenities.15" [Results, pp.3]

> "However, other studies conducted globally have reported a higher prevalence of abdominal obesity in older age groups compared to their younger counterparts.16 This trend is attributed to a decline in resting metabolic rate, hormonal changes, and reduced physical activity.17 Also, such a trend is likely to continue, as younger obese adults age into older adults. Therefore, there is a need for strong and strategic population-level interventions to reverse the trend of abdominal obesity increasing with age. It has been estimated that the number of overweight and obese individuals in India will increase considerably by 2040, particularly among rural residents and older Indians.18 India is currently undergoing demographic transition,19 and it is necessary to explore the factors affecting abdominal obesity separately among younger and older populations. It is worth noting that the prevalence of obesity among women in India varies significantly across different states. However, there is not much variation in the prevalence of obesity among men across different states. The demographic profile, socioeconomic distribution, cultural and dietary practices, the status of physical activities in the population and the interplay of all these variables could possibly explain such high variation of abdominal obesity in Indian women across Indian states. Jharkhand state has highest proportion (65%) of poor households in the country in the NFHS-5 survey sample, while more than three-fourth of population in Kerala and Punjab belongs to the richer section in the survey sample.20 This indicates that economic prosperity differentials amongst Indian states, rather than the geography, is a marker for abdominal obesity. However, other factors like cultural diversity, food habits, and status of physical activity across states also need to be studied further." [Results, pp.6]

"Abdominal obesity is not found to be strongly associated with the scheduled tribes in India, which comprise 8.08% of the Indian population." [Discussion, pp.8]

The findings of the paper indicate the exact opposite. The odds ratio of abdominal obesity among Scheduled Tribe women of 15–49 years is 0.60 (0.59 – 0.62) in comparison with that of women of the Scheduled Caste (Table 3).

"Indeed, as individuals move higher on the wealth index and secure better access to health services, they may become more vulnerable to abdominal obesity, particularly women in these social groups. The current study provides some indication of a possibility of scheduled tribe population also moving towards abdominal obesity in future. Further studies on specific social groups such as scheduled tribes, would provide a comprehensive analysis of unique health risks arising out of double burden of malnutrition. The policy research and

action focus should be on preventing specific social groups as scheduled tribes to acquire abdominal obesity." [Discussion, pp.8]
The conjecture, for the lack of a better word, is nonsense. We doubt that better access to health services make people vulnerable to abdominal obesity. In making a predictive claim on the future of abdominal obesity amongst people of the Scheduled Tribes, authors are again confusing the social determinant of health with the biological basis of health (similar error in the next paragraph on religion in the manuscript). Just because a person belongs to a particular social group does not mean they will be abdominally obese. Lastly, the "policy research and action focus" suggestion has been repeated multiple times for different social groups.

"As for Jains and Buddhists, while they may follow an austere lifestyle, it is still important to monitor and address any potential health risks, including abdominal obesity. While they may be small religious and ethnic minorities, every community deserves access to healthcare and support for healthy lifestyle practices." [Discussion, pp.8]
This is pure conjecture without any reference. Of course, everyone should have access to healthcare, but we fail to see the point of raising this here.

"Obesity has conventionally been recognised as an issue pertaining to urban and wealthier sections of society. However, the NFHS-5 data highlights a considerable difference in obesity trends between urban and rural populations in India. …" [Discussion, pp.8]
This paragraph repeats the same points raised earlier.

"The report reveals that majority of the Indians (W-71%, M-83%) are now non-vegetarians, who either regularly or occasionally consume egg or meat." [Discussion, pp.8, emphasis added]
"Indians are shifting to non-vegetarian diet, processed foods, aerated drinks, and carbohydrate and fat rich foods" [Discussion, pp.9, emphasis added]
The authors have added temporality by adding "now" and "shifting to". The message is that the Indian diet is shifting from vegetarian to non-vegetarian. The authors have not provided any source and their analysis is insufficient to make this claim.

"A literature review done for finding a relationship between overweight, obesity and related noncommunicable diseases amongst Asian Indian girls and women concluded that abdominal obesity is higher in Asian Indians compared to white Caucasians and had an association with insulin resistance and multiple cardiovascular risk factors.8 Another review done on physical activity levels amongst South Asian women found that physical activity was particularly low amongst the South Asian women in the post pregnancy years, when caretaking duties were less.4" [Discussion, pp.9]
This paragraph, like many others, stands alone, adding no value whatsoever in light of the results.

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