6   RESULTS

Door to door survey resulted from 162,330 participants after filling NMB questionnaire. From these, 49,226 individuals had high ≥60 IDRS scores; 27,611 came for biochemical assessments. Prediabetes was 7,920 in the range (HbA1c 5.7-6.49%). 4450 eligible individuals from 80 clusters were randomized to intervention (n=2316) and control (n=2134). Due to a 24% loss for follow-up, the final analyzed number was 3380, with 1712 in yoga and 1668 in the control groups.

The mean age was 48.7±10.6 years; 60.00% (n=2670) were females, and the mean BMI was 26.5±4.55 kg/m^2 (Table 9). Their mean for No Physical activity was 1203 (27%) (Table 9). No significant differences in the distribution of the demographic and clinical characteristics between the two groups were even with the non-significant difference between groups (p>0.05) (Table 9).

TABLE 11: BASELINE DATA FOR TRIAL PARTICIPANTS

Characteristics	Overall (n=4450)	yoga (n=2316)	Control (n=2134)	P value
Clusters, n (%)				
Overall	80	40	40	
Rural	44 (55.00)	23 (57.50)	21 (52.50)	0.653
Urban	36 (45.00)	17 (42.50)	19 (47.50)	
Age, years	48.7±10.6	47.9±10.46	48.1±9.91	0.847
Gender, n (%)				
Female	2670 (60.00)	1414 (61.05)	1256 (58.86)	0.072
Male	1780 (40.00)	902 (38.95)	878 (41.14)	
BMI, Kg/m^2	26.5 (4.55)	26.6 (4.21)	26.5 (4.87)	0.564
>23 Kg/m^2, n (%)	597 (13.41)	297 (12.82)	300 (14.06)	
<23 Kg/m^2, n (%)	2179 (48.97)	1111 (47.97)	1068 (50.04)	
Physical activity, n (%)				
Vigorous	666 (14.83)	344 (14.85)	322 (15.09)	
Moderate	669 (15.06)	347 (14.98)	322 (15.09)	
Mild	842 (18.92)	438 (18.91)	404 (18.93)	0.152
No activity	1203 (27.15)	583 (25.17)	620 (29.05)	

FIGURE 103: BREAK-UP OF PHYSICAL ACTIVITY OF PARTICIPANTS

## 6.1 PRE-POST STRESS RESULT VARIABLES FOR INTERVENTION, CONTROL GROUP

The statistical findings for variables viz. stress, Urban, rural, female, male, persons with age below 40 years, age above 40 years, prediabetes with fasting blood sugar (FBS), blood sugar level after food (PPBS), 3 months Glycosylated Hemoglobin (HbA1c) for intervention yoga group and control group is as follows in tabular form.

TABLE 12: PRE / POST RESULTS FOR VARIABLES FOR INTERVENTION, CONTROL GROUP

Variables	Yoga	Control	Significance	Partial Eta squared
Stress Pre	19.5543	20.9283	0.512	0.001
Stress Post	18.05	20.095		
Urban pre	19.4091	19.8293	0.570	0.000
Urban post	17.5260	19.4634		
Rural pre	19.9916	19.3333		

|				
Rural post	16.5714	20.7333		
Age<40 pre	18.8276	19.7586	0.604	0.000
Age<40 post	16.8448	24.7931		
Age>40 pre	19.9074	19.5841		
Age>40 post	17.1296	18.7699		
Male pre	20.5192	19.0145	0.002	0.011
Male post	17.1827	19.4203		
Female pre	19.1647	20.1918		
Female post	17.000	20.5479		
Pre FBS	127.224	109.066	0.001	0.048
Post FBS	111.535	120.434		
PrePPBS	167.321	143.077	0.001	0.076
Post PPBS	143.745	161.649		
preHbA1c	5.967	5.968	0.001	0.001
Post HbA1c	5.7726	6.1		
Pre stress Pre dm	19.678	19.6197	0.682	0.001
Post stress Pre dm	17.0693	20.00		

FIGURE 14: GRAPH OF PRE POST STRESS FOR YOGA GROUP, AFTER THREE MONTHS YOGA-BASED LIFESTYLE PRACTICE
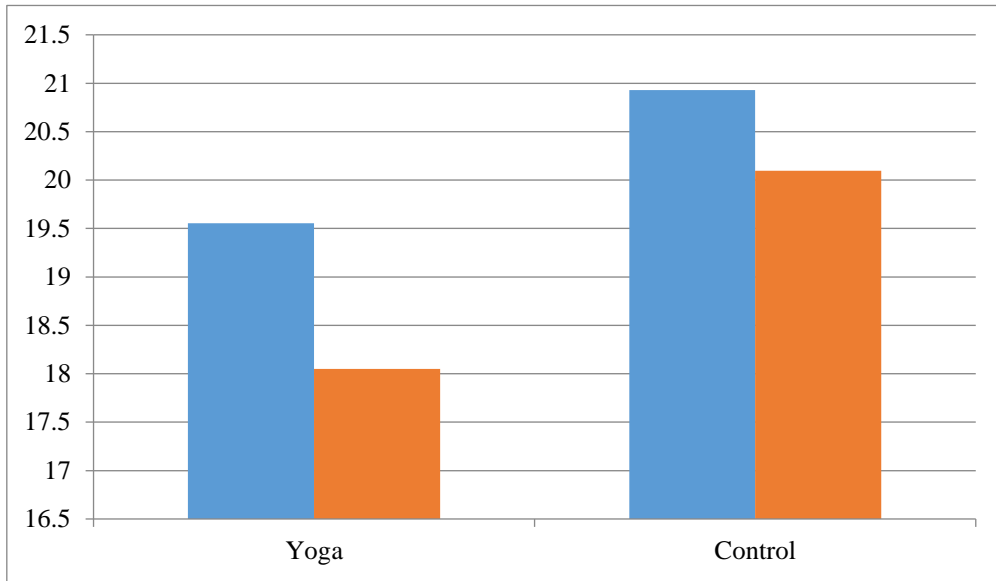
Mean value of prepost stress in yoga group reduced significantly as compared to control group, p value is 0.512.
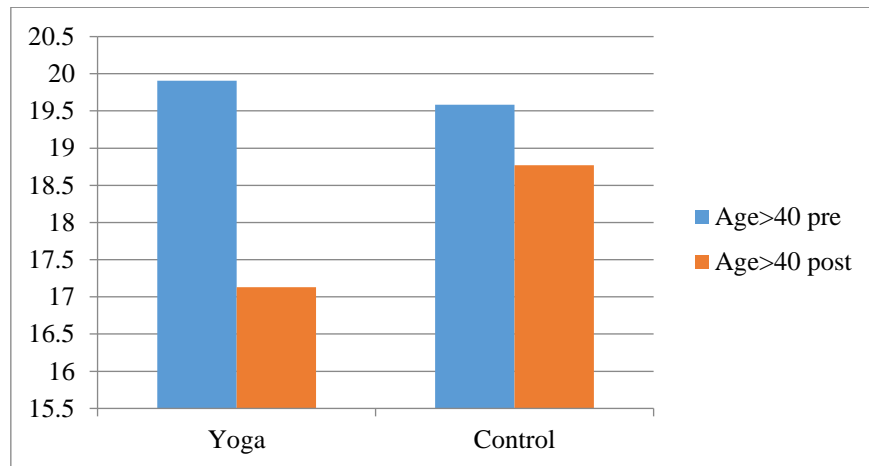
6.2   AGE<40 GROUP

FIGURE 15: GRAPH OF PRE POST STRESS FOR AGE <40 YEARS CATEGORY OF YOGA GROUP VERSUS CONTROL GROUP, AFTER THREE MONTHS STANDARD CARE
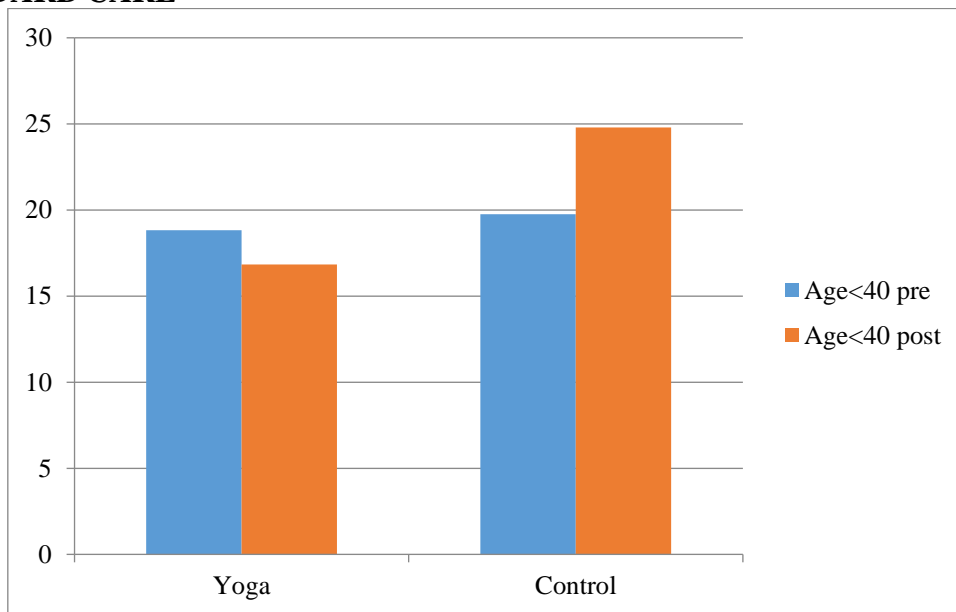
Mean of prepoststress for age < 40 years of yoga group versus that of control group is reduced, p value is 0.604..
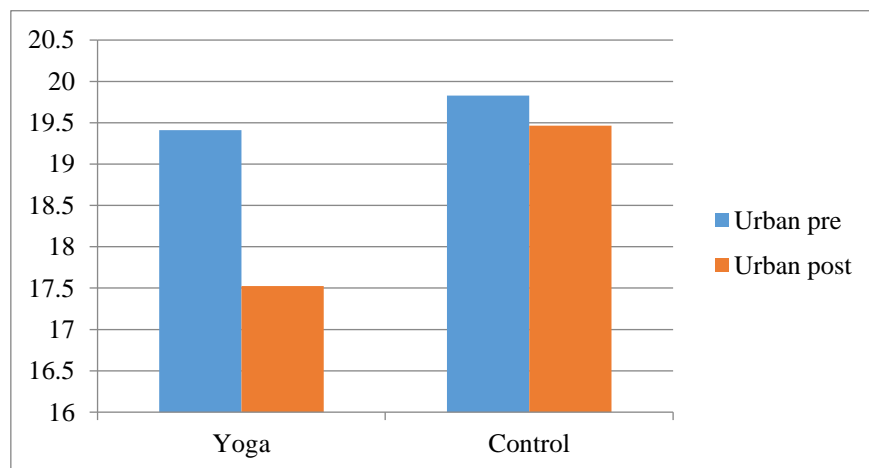
6.3   AGE >40 GROUP

FIGURE 16: GRAPH OF PRE POST STRESS FOR AGE >40 YEARS CATEGORY YOGA   GROUP VERSUS CONTROL GROUP, AFTER THREE MONTHS STANDARD CARE

Mean of prepoststress for age above 40 of yoga group versus that of control group is reduced, p value is 0.604.
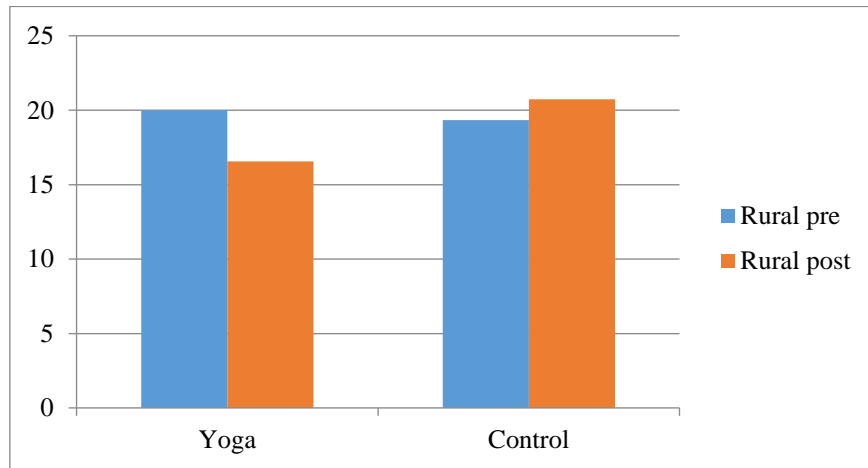
6.4   URBAN GROUP

FIGURE 17: GRAPH OF PRE POST STRESS FOR URBAN YOGA GROUP VERSUS CONTROL GROUP, AFTER THREE MONTHS STANDARD CARE

Mean of prepoststress for urban category of yoga group versus that of control group is reduced , p value is 0.570.
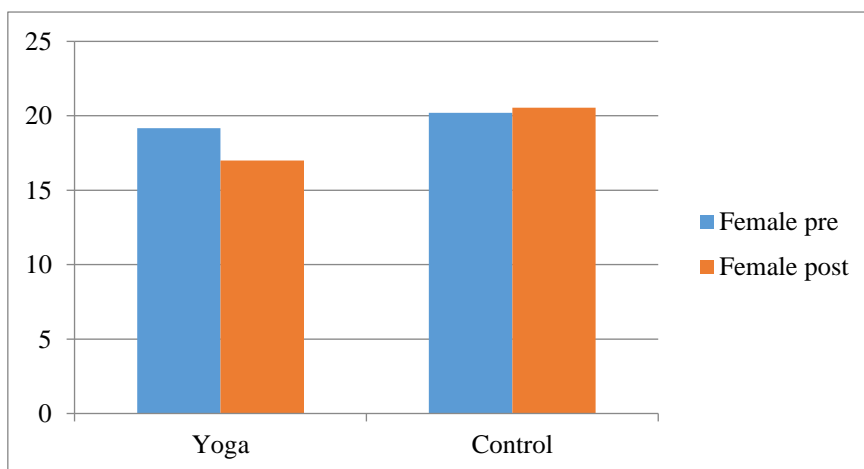
6.5   RURAL GROUP

FIGURE 18: GRAPH OF PRE POST STRESS FOR RURAL CATEGORY OF YOGA GROUP VERSUS CONTROL GROUP, AFTER THREE MONTHS YOGA-BASED LIFESTYLE PRACTICE

Mean of prepoststress for rural category of yoga group versus that of control group is reduced, p value is 0.570.

6.6   FEMALE GROUP

FIGURE 19: PRE-POST STRESS FOR FEMALE YOGA GROUP AND CONTROL GROUP, AFTER THREE MONTHS YOGA-BASED LIFESTYLE PRACTICE

Mean of prepoststress for female of yoga group versus that of control group is reduced, p value is 0.002 which is significant.

6.7 MALE GROUP

FIGURE 20: PRE-POST STRESS FOR MALE IN YOGA AND CONTROL GROUP, AFTER THREE MONTHS YOGA-BASED LIFESTYLE PRACTICE
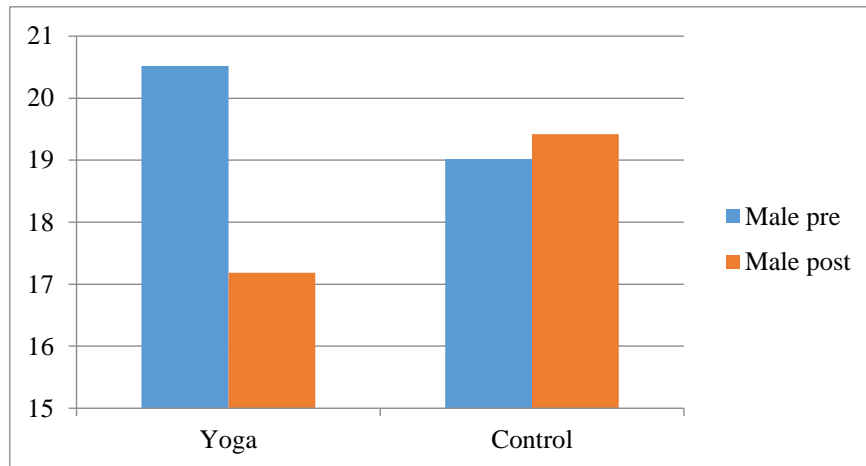

Mean of prepoststress for male of yoga group versus that of control group is reduced, p value is 0.002 which is significant.

Continuous variables are represented as means (SD); categorical variables are expressed as a number (percentage), FBG, Fasting blood glucose; PPBG, Postprandial blood glucose; BMI, Body mass index; P-value, independent t-test for continuous variables, chi-square test for categorical variables (From Table 12).

1.Mean of prepost BLFBS of yoga group versus that of control group is reduced, p value is 0.001 which is significant.

2. Mean of prepostBLPPBS of yoga group versus that of control group is reduced, p value is 0.001 which is significant

3. Mean of prepostBLHBA1C of yoga group versus that of control group is reduced, p value is 0.001 which is significant
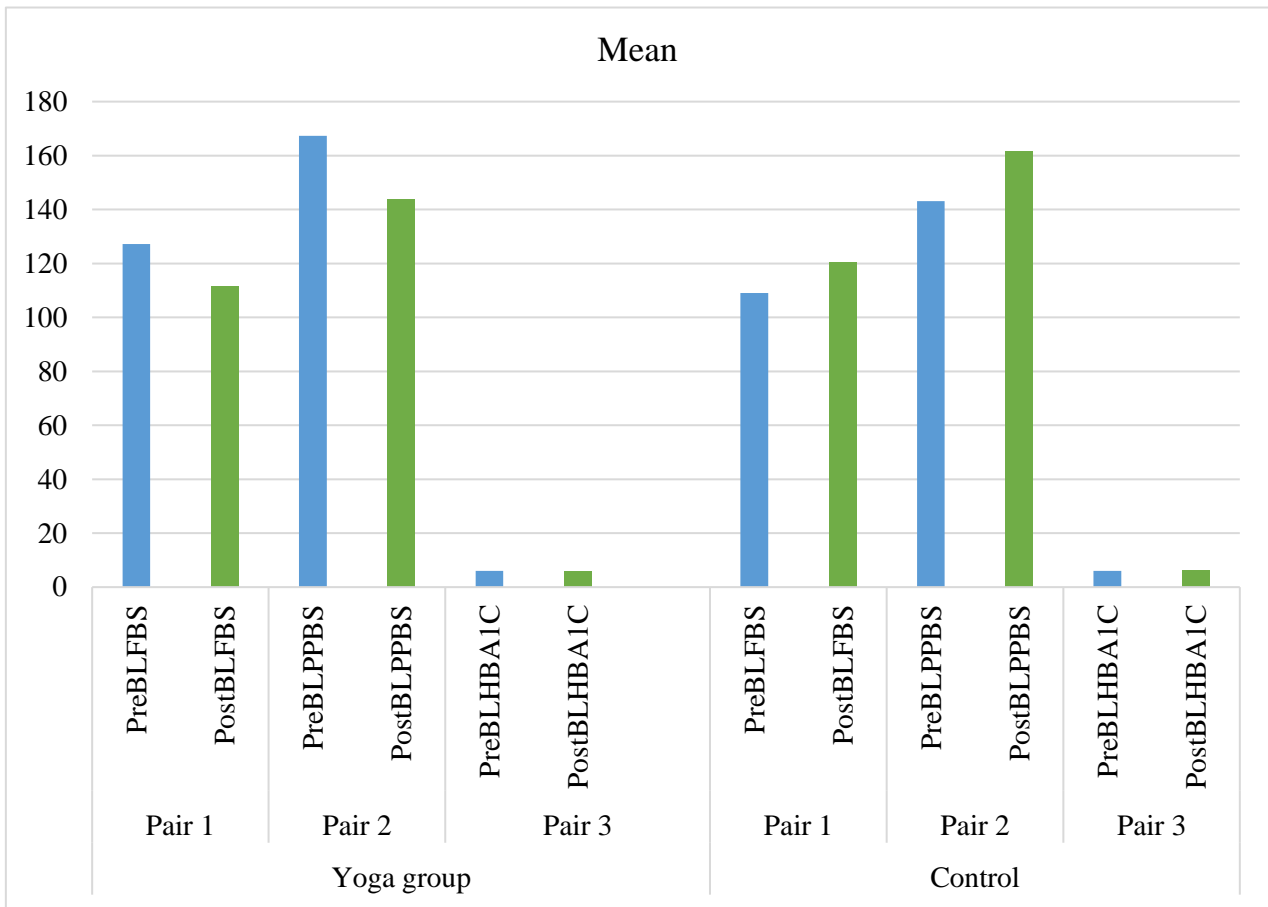
FIGURE21: GRAPHICAL -COMPARISON BETWEEN PRE-POST RESULTS FOR SUGAR (FBS, PPBS, HBA1C) - YOGA AND CONTROL GROUP

In the prepost stress results file, under "Prediabetes FBS, PPBS,HBA1C yoga group V/S CONTROL GROUP," the p-value is 0.001, which is less than 0.05. Hence, we can conclude a statistically significant difference in the "pre-stress" and "post-stress." (Table 12)

Similarly, in the "Urban. Rural, age<40,age>40 group" prepost stress results, the p-value is more significant than 0.05. Hence, we did not reject the null hypothesis and concluded that there is No statistical difference between "prestress" and "post-stress" datasets.

In statistical findings for different Groups viz. Rural, Urban, Female, Male, under 40 Age group, above 40 Age Group for Control and yoga Group for pre-stress and post-stress using Perceived stress scale were as follows

**TABLE 134: P-VALUE DERIVED FROM PEARSON'S CHI-SQUARE TEST**

Variables	Conversion to diabetes n (%)		P-value
	YBL (n=1712)	Control (n=1668)	
Overall, n=3380	192 (11.2)	534 (32.01)	<0.05
Age, years			
≤40 years	40 (8.26)	120 (26.67)	<0.05
>40 years	152 (12.38)	414 (33.99)	<0.05
Gender			
Male	68 (10.00)	210 (30.30)	<0.05
Female	124 (12.01)	324 (33.73)	<0.05
Area			
Rural	40 (8.06)	282 (33.73)	<0.05
Urban	152 (12.50)	252 (30.0)	<0.05
BMI, Kg/m^2			
≤23	104 (9.70)	348 (33.14)	<0.05
>23	44 (13.92)	90 (29.41)	0.00003

TABLE 145: CONVERSION PREDIABETES TO NORMOGLYCEMIA IN THE INTERVENTION AND CONTROL GROUPS

Pearson's chi-square test, odd's ratio calculated by logistic regression, adjusted for age, gender, BMI, family history and area except for the categorizing variables, $P_{interaction}$ calculated as per the statistical notes reported by Altman and Bland, 2003

		Conversion to			Logistic Regression			Interaction	
		YBL	Control	P value	Odd's Ratio (95% CI)		P value	Z score	P value
Overall,	**n**	904	630	<0.0001	1.26	(1.05-	0.012		
Age									
Age≤40		264	138	<0.05	2.20	(1.57-	<0.001	3.74	<0.0001
Age>40		640	492	<0.05	1.02	(0.82-	0.870		

Gender								
Females, n	520	342	<0.05	1.31	(1.04-	0.020	0.47	0.319
Males, n (%)	384	288	<0.05	1.20	(0.90-	0.441		
Area								
Rural, n (%)	228	360	.000077	1.57	(1.19-	<0.0001	1.53	0.063
Urban, n	676	270	<0.05	2.08	(1.65-	<0.0001		
BMI								
≤23 Kg/m^2,	544	378	<0.05	1.14	(0.93-	0.196	0.67	0.251
>23 Kg/m^2,	188	114	<0.05	1.72	(1.17-	0.002		
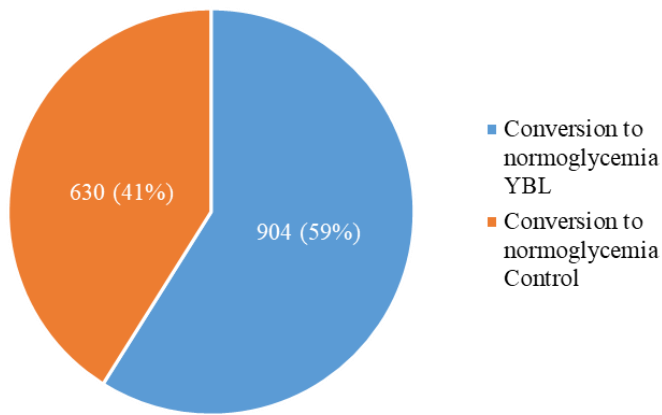
FIGURE22: OVERALL CONVERSION TO NORMOGLYCEMIA (YBL VS. CONTROL)

In YBL Group, the conversion rate from prediabetes to normoglycemia was (52.80% in intervention vs. 37.80% in the control group, $P = 0.005$) over three months.
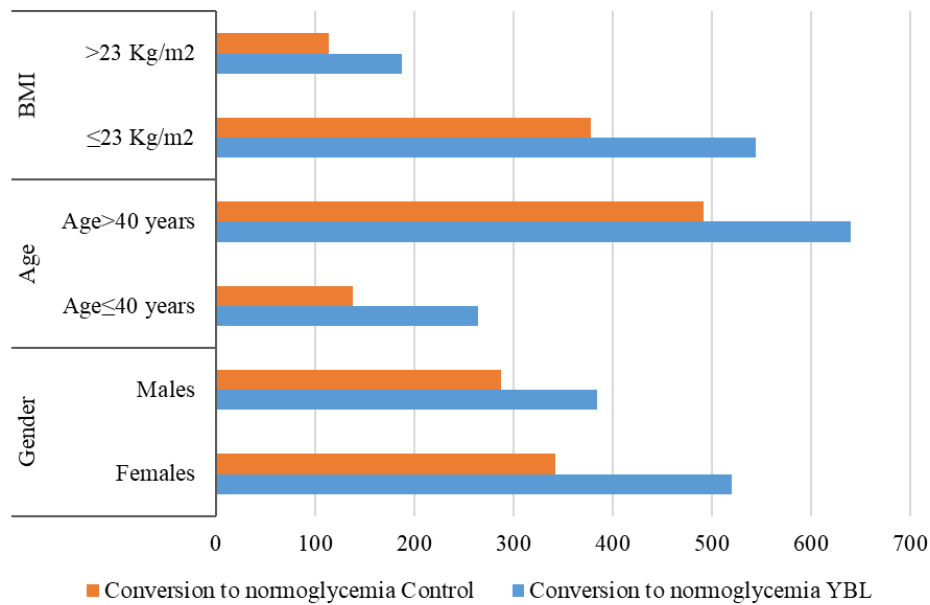
FIGURE 23: COMPARATIVE CONVERSION TO NORMOGLYCEMIA ACROSS BMI, AGE & GENDER CATEGORIES

The conversion to normoglycemia after YBL was significantly better in the younger age group (≤40 years) than those above 40yrs, with OR=2.20 (95% CI 1.57-3.08) and OR=1.02 (95% CI 0.82-1.26), respectively) (Table 28). Conversion to normoglycemia was found to be equally effective in both genders.

6.8   PARTICIPANTS NUMBER AND VARIATION ACROSS INDIA

Respondent's survey revealed that 11.8% practice yoga, 88.2% didn't practice yoga across India of112,735. Among gender, 6.2% male and 5.5% female were practicing yoga. North zone has highest [4,567/112,735] and east zone has lowest [971/112,735]. Location wise urban population 6.3% and in rural 5.7% practiced yoga. Among the Diabetic population, 15% and 11% non-diabetic population practiced yoga.

Out of 101,643 respondents, 94,135 believed that yoga improved their lifestyle (92.6%), and 90,102/98,518(91.4%) believed that yoga prevented T2DM, revealing an immense

knowledge–practice gap (Table12). General acceptability with knowledge–practice yoga

gap has the scope of integrating modern medicine to change conventional healthcare.

TABLE 156: QUESTIONNAIRE OUTCOME: ANSWERS TO: "DO YOU THINK YOGA CAN HELP IN THE PREVENTION AND MANAGEMENT OF DIABETES?"

	YES		NO		TOTAL		P value
	N	%		%		%	
Male	47,488	91.5	4428	8.5	51,916	100	<0.0001
Female	42,614	91.4	3968	8.6	46,602	100	<0.0001
Total	90,102	91.5	8416	8.5	98,518	100	
NO T2DM	77,635	90.9	777	9.1	85,414	100	<0.0001
Self-Reported	9454	95.2	476	4.8	9930	100	<0.0001
Status T2DM	87,089	91.3	8255	8.7	95344	100	

Perception of yoga for Diabetes Prevention Table 30 shows the answers to the question, "Do

you think yoga can help prevent and manage diabetes?"
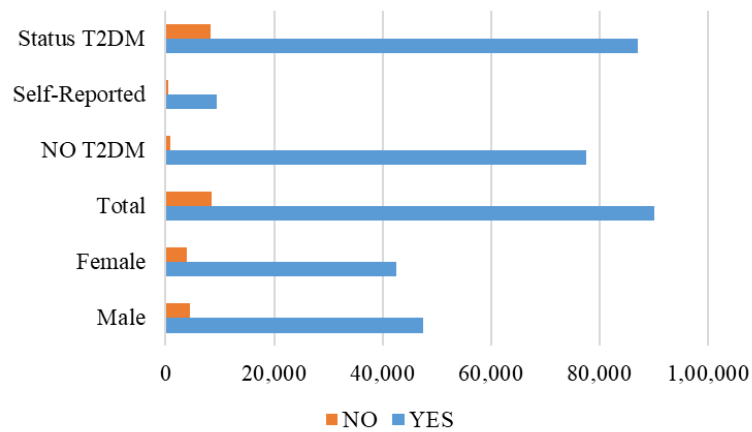
FIGURE 24: RESPONSE FROM PARTICIPANTS ON YOGA HELPS TO MANAGE DIABETES

The majority of 98,518 (47,488 males and 42,614 females) believe that yoga prevents and manages diabetes. Participants with diabetes 9454 of 9930 and non-diabetic participants 77,635of 85,414 believed yoga helps prevent Diabetes (Table 30).

TABLE 167: PREDIABETES AND STRESS TEST

Scales	Group	N	Mean	Std.deviation	t-value	p-value
VAS	Pre-diabetes	2173	20.62	11.38	-1.66	0.09
	Diabetes	2144	21.20	11.66		
PHQ	Pre-diabetes	597	6.87	6.66	1.95	0.04
	Diabetes	440	6.09	6.01		
PSS	Pre-diabetes	649	13.58	8.93	2.16	0.03
	Diabetes	485	12.41	8.98		
Stress(f1)	Pre-diabetes	656	7.66	5.65	2.10	0.03
	Diabetes	495	6.95	5.65		
Counter stress (f2)	Pre-diabetes	704	5.91	4.05	1.35	0.17
	Diabetes	508	5.58	4.24		

The stress and depression levels in people with diabetes and Prediabetes bases on analysis of multiple scales (VAS.PHQ, PSS). Perceived Stress Scale (PSS-10) was used to determine stress {prediabetic (PD) = 649, diabetic (D) = 485} and Visual Analog Scale (VAS) {n, PD = 2173, D = 2144}. The Patient Health Questionnaire (PHQ-9) was administered to assess depression {n, PD = 597, D = 440}. Table 31 outlines stress scores from each scale to compare stress levels in persons with prediabetes and T2DM.
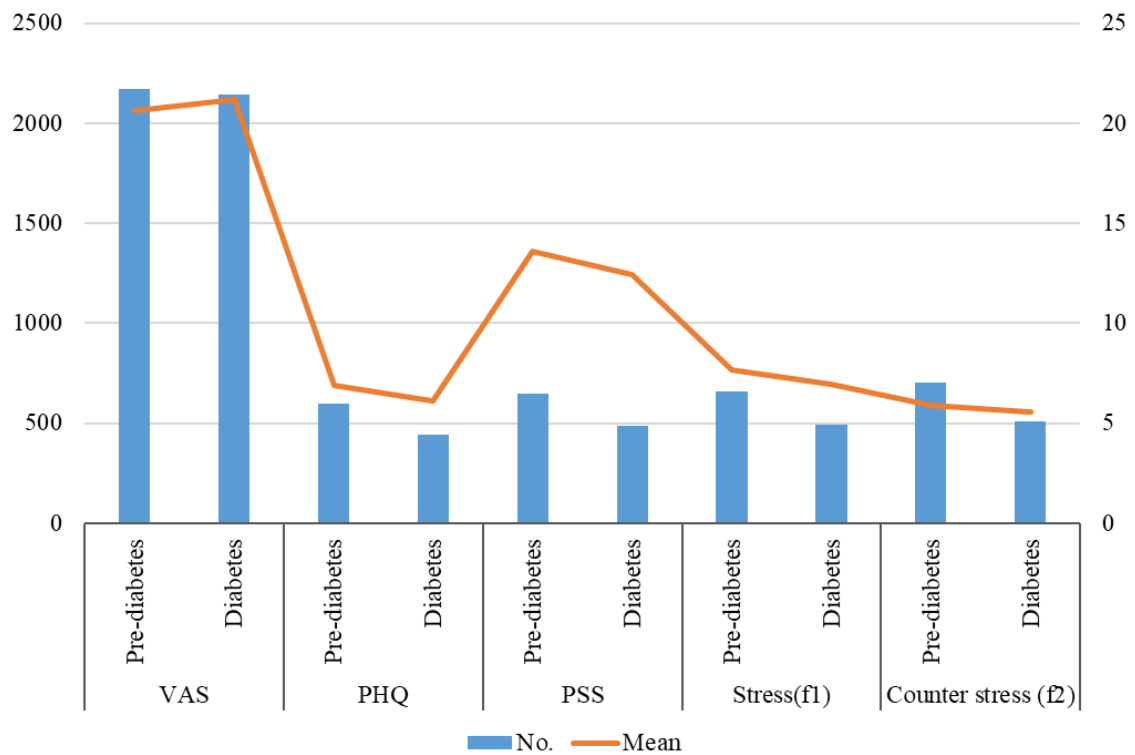
FIGURE 25: STRESS & DEPRESSION LEVEL BASED ON MULTIPLE SCALES

Total VAS scores were (non-significantly) higher in those with T2DM than those with prediabetes (VAS: 21.20 vs. 20.6; test statistic -1.66; $p = 0.09$). In contrast, unidirectional analysis of the PSS scale showed a significant difference between those with prediabetes and diabetes (13.6 vs. 12.4; test statistic 2.16; $p = 0.03$) group. Furthermore, the bidirectional analysis revealed a significant difference in stress factors in the prediabetic group (7.7 vs. 7.0. test statistic 2.10; $p = 0.03$). Persons with prediabetes had significantly higher depression scores (mean PHQ-9 scores: 6.9 vs. 6.1; test statistic 1.95; $p = 0.04$) than those with T2DM

TABLE 17: PERCEPTION OF YOGA BENEFITS IN DIFFERENT ZONES OF INDIA

Factor	Percentage of individuals in each zone on yoga benefit scale (YBS)						
	North	East	West	South	Central	Northeast	All India
Physical	98.4	74.1	66.5	77.1	18.3	65.4	69.6
Psychological	97.5	77.1	66.8	79.0	17.6	77.1	74.4
Spiritual	88.9	24.8	42.5	56.7	15.0	54.6	51.6
Perception of barriers for yoga practice (BFYS) in different zones of India							
Factor	North	East	West	South	Central	Northeast	All India
Physical	76.5	7.9	52.2	67.7	4.0	61.0	50.0
Psychological	48.0	10.7	30.3	40.7	1.9	18.3	33.9
Social	45.3	8.7	19.8	45.2	5.6	63.1	35.9

6.9   PERCEPTIONS OF BENEFITS OF *YOGA* IN AGE GROUPS

The belief that yoga improves several health-related outcomes, as present in the 'yoga Benefit Scale,' was agreed by most survey respondents without any statistically significant differences in perception among the age groups. There were notable differences between the two age groups in the spiritual factor. Regarding "being Closer to Higher Power" (Agreed by 78.9% of participants in the age group <45 years vs. 85.3% of participants in the age group of 45 and above; p<0.001). Similarly, significantly higher number of elderly people agreed to the item "Improvement in present moment awareness" (91.4% of responders <45 years vs 93.7% of responders >45 years. p=0.013); "Breathing rate" (81% of <45 years age vs 87.6% of age >45 years agreed; p<0.001); "Stamina" (96.8% of <45 years age vs 97.7% of > 45 years agreed; p=0.026). Thus, a higher percentage of individuals above 45 years

agreed that yoga accords spiritual and a few other benefits to the practitioner, with significant differences between groups. Although overall, more than 90% had agreed to the benefits on all three factors.

6.10 BARRIERS TO THE PRACTICE OF YOGA SOCIAL BARRIERS IN YOGA PRACTICE

Most respondents believed they did not face a barrier to practicing yoga. However, a group of respondents felt some barriers hindered them to a greater extent than others. Notably, the barriers of "Discipline," "Few places to do yoga," "Occupational commitments," and "Family commitments" emerged as the most significant barriers across age groups in the descending order of frequency among responses. The "45 and above" age group mainly perceived these as a barrier to practice yoga. These differences of perception between the young and the elderly groups were statistically significant. Interestingly, the barrier to the practice of yoga "Due to disease" was not considered necessary by most of the respondents across both Age Groups, with 81.9% of respondents finding no barrier due to disease.