

Efficacy of a Mobile Health Intervention in Improving Micronutrient Supplement Use during Pregnancy- a Randomized Controlled Trial

Evidence from Pakistan

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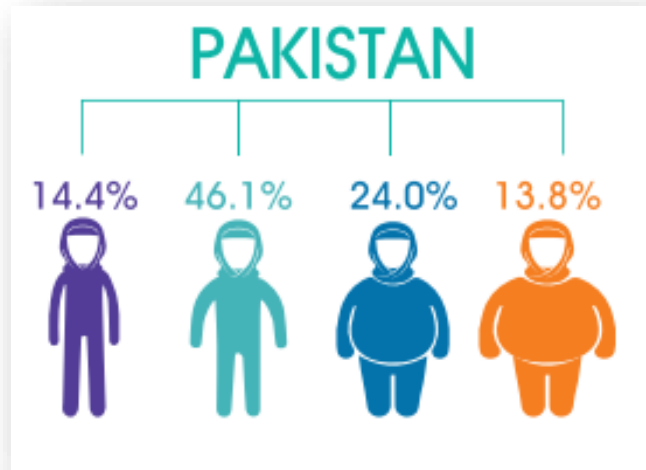
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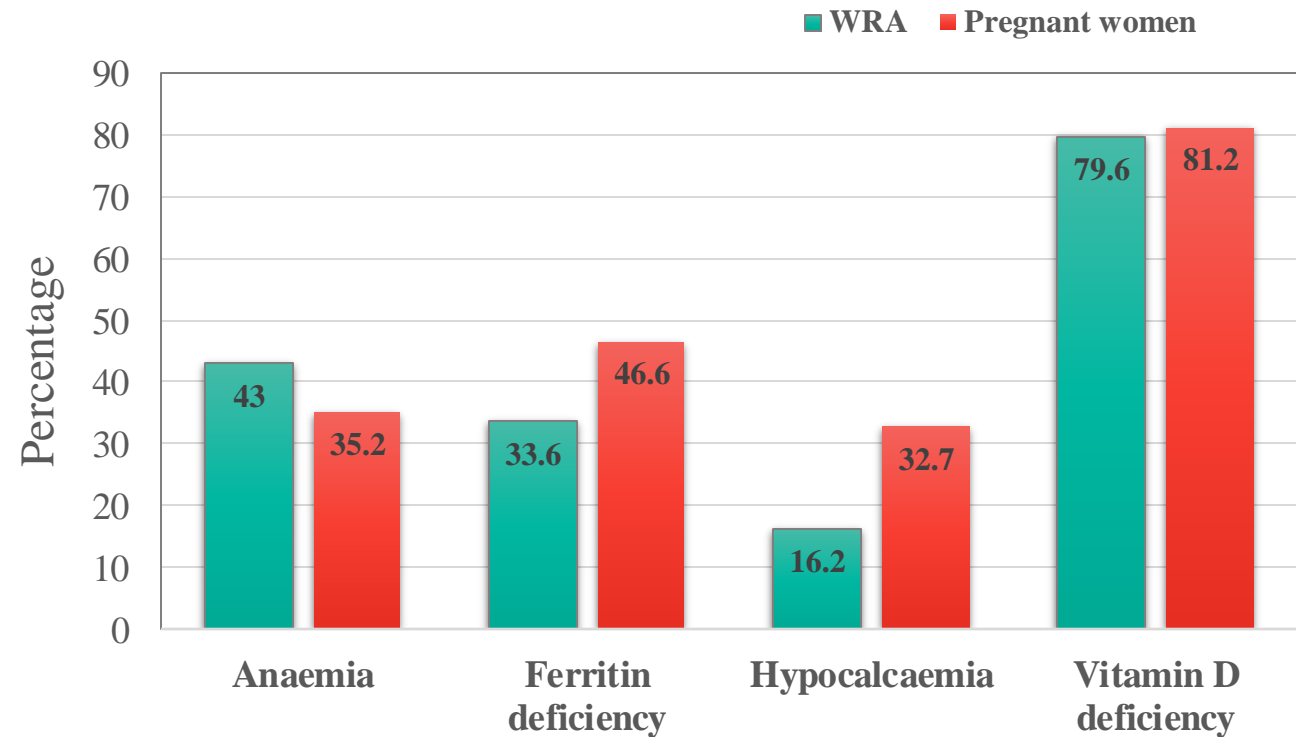
Background and Rationale

Triple Burden of Malnutrition in Women of Reproductive Age



Minimum Dietary Diversity
27.6%

Micronutrient deficiencies



Micronutrient supplement use during pregnancy

Iron Folic Acid

33.4%

Calcium

26.8%

**Multiple
Micronutrient**

6.2%



Antenatal Care



Widely used to educate women

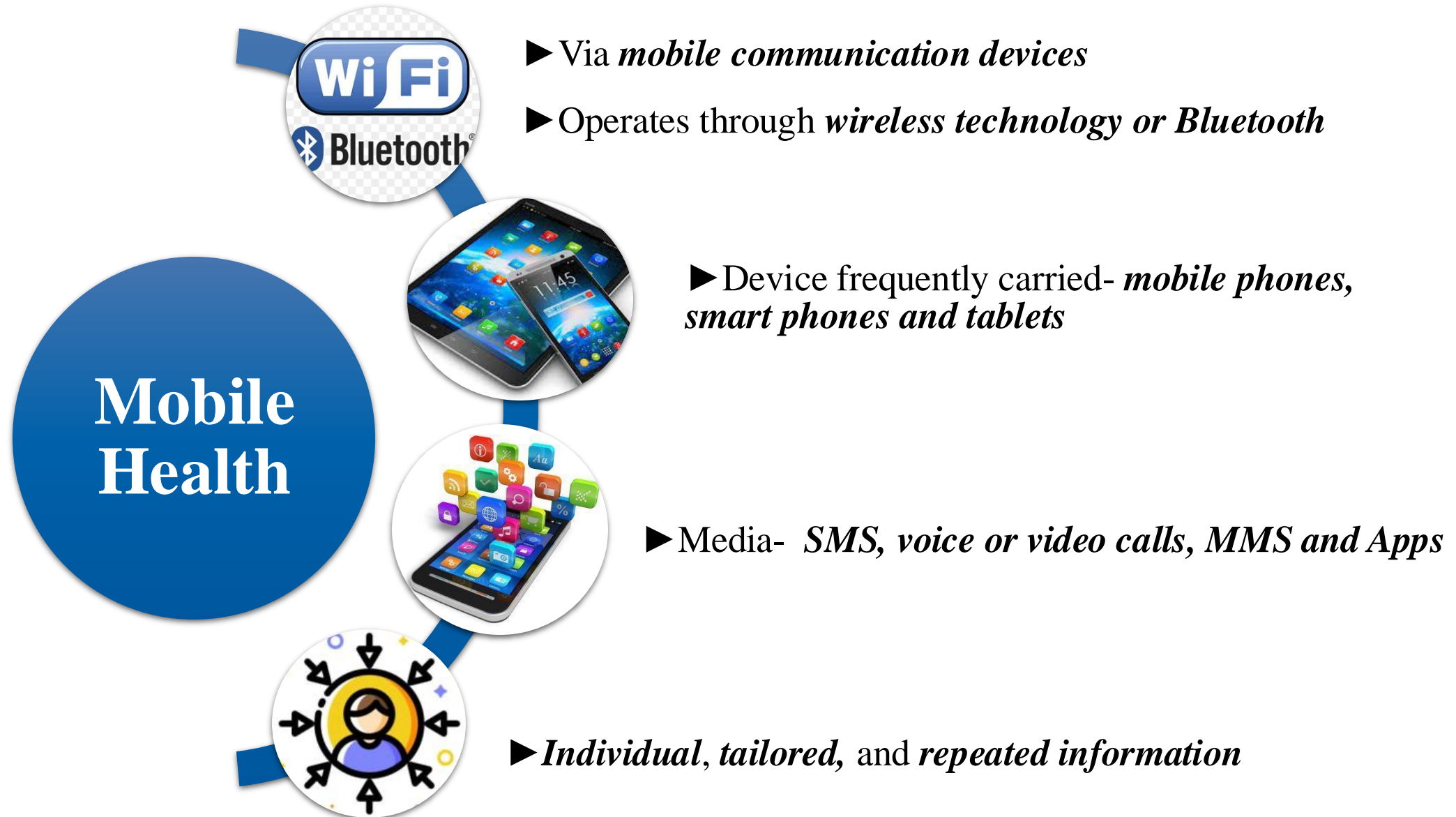
Supports behavior change

Usual process:

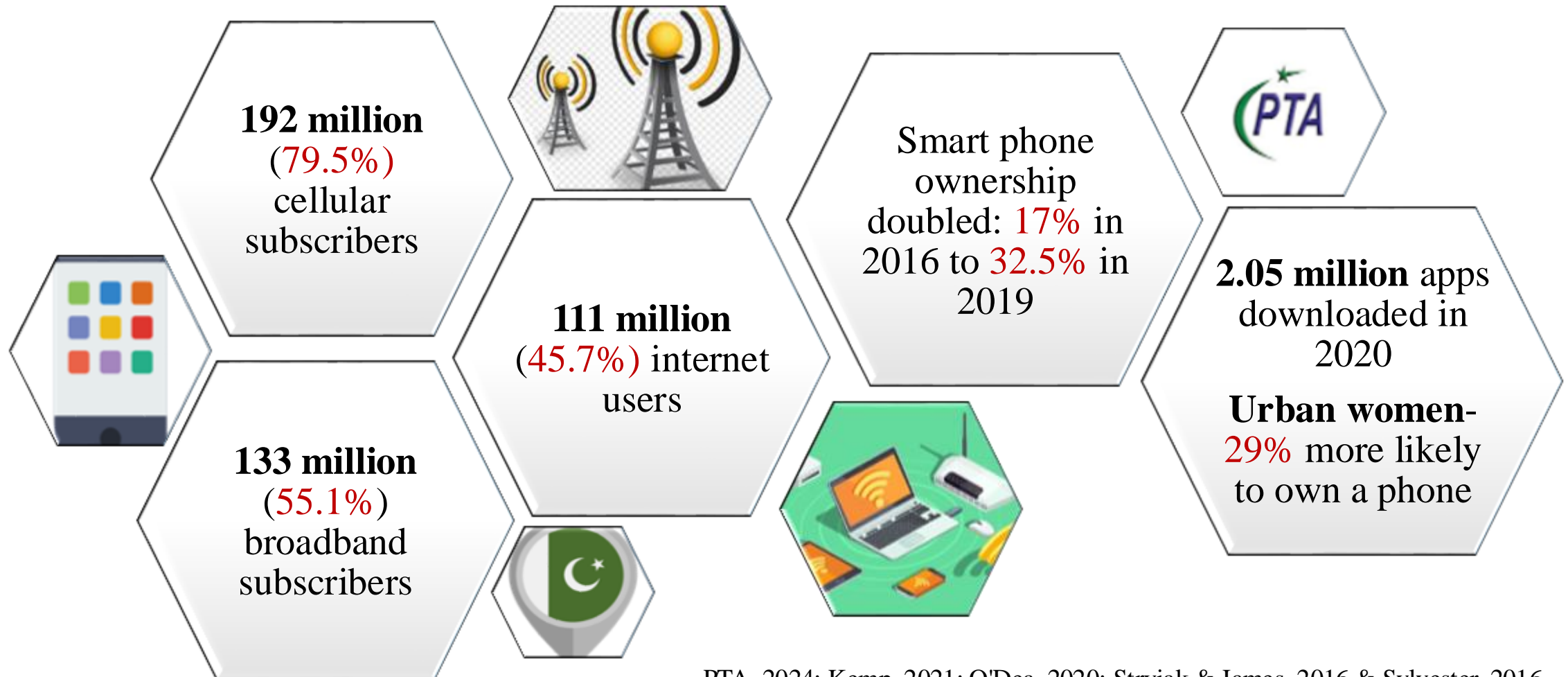
- * Face-to-face consultation
- * Counselling – pregnancy stage
- * Time bound, brief and non-personalized
- * Compliance not assessed

Communication often insufficient

Low quality



Digital Landscape in Pakistan



Research Objective

To assess the efficacy of mHealth intervention in improving micronutrient supplement use among pregnant women compared to traditional face-to-face counselling

Methods

Study design	<ul style="list-style-type: none">• Randomized controlled trial• Allocation ratio 1:1
Study Groups	<ul style="list-style-type: none">• Two groups; <i>Intervention and Non-intervention</i>
Randomization	<ul style="list-style-type: none">• Block randomization (size 6)• Clinical trials unit
Study site	<ul style="list-style-type: none">• Antenatal clinics• Aga Khan University Hospital
Sample size	<ul style="list-style-type: none">• 306 pregnant women• 153 in each group

Eligibility Criteria

Inclusion

- Pregnant women in first trimester
- Adults (at least 18 years)
- Registered at Aga Khan University Hospital for delivery
- Possessed personal smartphone, with internet connection.
- Able to read and write in Roman Urdu or English
- Consented to participate

Exclusion

- Had dietary restrictions due to comorbidities
- Used regular medications
- Diagnosed with serious medical condition- kidney or liver diseases, autoimmune disorders
- Had language barrier

Study Groups

Intervention group

- **Mobile app “PurUmeed Aaghaz”**- a hopeful beginning
- **Features:** Personalized recommendations and push messages

Non-intervention group

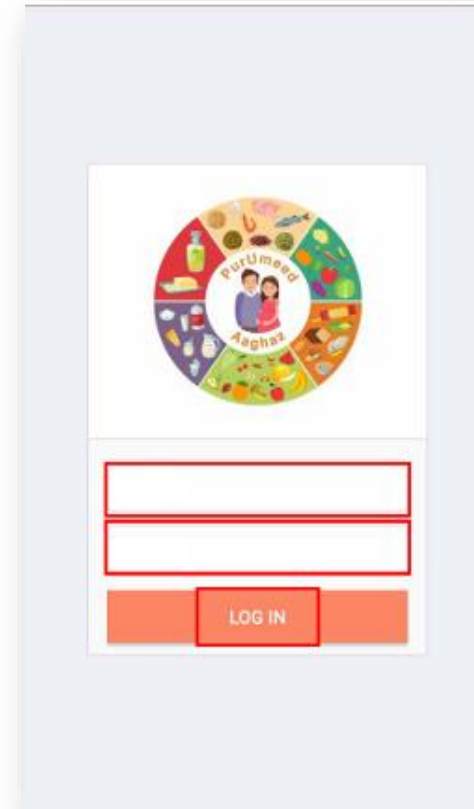
- Standard face-to-face counselling

Counselling

- Folic acid (0.4 mg), iron (30-60 mg), calcium (1500-2000 mg), and vitamin D3 (200 IU)

Follow-ups

- At 6, 12, 18 and 24 weeks after enrollment



Statistical Analysis

- Compared sociodemographic characteristics, obstetric history and anthropometric assessment using Chi-square, Fisher exact or t-test
- Panel data and random effects analysis
- Unadjusted and adjusted analysis using binary logistic and linear regression
- Supplement use scored as **0** (7 days a week), **1.5** (4-6 days) and **3** (0-3 days)
- We combined the scores of **0** and **1.5** as ‘adequate’ and **3** as ‘inadequate’ categories
- Cumulative supplement use score ranged from **0 to 12**; higher score, inadequate use

Results

Table 1: Baseline sociodemographic characteristics

Characteristics	Intervention (n=153)	Non-intervention (n=153)	p-value
	n (%)	n (%)	
Sociodemographic characteristics			
Age (years) mean ± SD	28.7 ± 4.3	28.1 ± 4.1	0.162
Education, Self , University	119 (77.8)	120 (78.4)	0.890
Occupation, Self , Employed	50 (32.7)	54 (35.3)	0.629
Education, Spouse , University	143 (93.5)	138 (90.2)	0.297
Monthly household income (PKR), <100,000	92 (60.1)	103 (67.3)	0.191
Obstetric history and anthropometric assessment			
Gravida , Primi	69 (45.1)	65 (42.5)	0.645
Vomiting	86 (56.2)	82 (53.6)	0.646
Antiemetic use	58 (37.9)	51 (33.3)	0.403
Body Mass Index (Kg/m ²)			
Underweight (<18.5)	10 (6.5)	14 (9.2)	0.687
Overweight/obese (≥23)	98 (64.1)	94 (61.4)	

Characteristics	Intervention (n=153)	Non-intervention (n=153)	p-value
	n (%)	n (%)	
Lifestyle habits			
Substance use, Self	0 (0)	5 (3.3)	0.060
Smoker, Spouse	30 (19.6)	31 (20.3)	0.886
Daily intake of home-cooked meals , Thrice	114 (74.5)	116 (75.8)	0.791
<i>Weekly consumption of:</i>			
Savory snacks	81 (52.9)	85 (55.6)	0.646
Sweet snacks	113 (73.9)	116 (75.8)	0.693
Readymade meals	87 (56.9)	82 (53.6)	0.565
Carbonated beverages	74 (48.4)	69 (45.1)	0.567
Packaged juices	49 (32.0)	56 (36.6)	0.399
Tea	93 (60.8)	95 (62.1)	0.814
Coffee	10 (6.5)	10 (6.5)	>0.999

Table 2: Improvement in micronutrient supplement use from baseline to end line

Micronutrient supplements	Baseline (T0)			End line (T4)			Improvement (T4 –T0)	
	Intervention (n=153)	Non-intervention (n=153)	p-value	Intervention (n=107)	Non-intervention (n=125)	p-value	Intervention	Non-intervention
	n (%)	n (%)		n (%)	n (%)			
Adequate use of:								
Folic acid	124 (81.0)	121 (79.1)	0.834	104 (97.2)	121 (96.8)	0.544	20%	22.4%
Iron	12 (7.8)	36 (23.5)	<0.001	102 (95.3)	91 (72.8)	<0.001	11.2 times	2.1 times
Calcium	47 (30.7)	9 (5.9)	<0.001	71 (66.4)	112 (89.6)	<0.001	1.2 times	14.2 times
Vitamin D	31 (20.3)	37 (24.2)	0.232	86 (80.4)	69 (55.2)	<0.001	3 times	1.3 times
Cumulative supplement use score mean± SD	7.72 ± 3.05	7.87 ± 2.66	0.654	1.79 ± 2.46	2.54 ± 2.30	0.017	-76.7%	-67.7%

Table 3: Efficacy of mHealth intervention on adequacy of micronutrient supplement use

Micronutrient supplements	Unadjusted		Adjusted	
	OR (95% CI)	p-value	aOR (95% CI)	p-value
Folic acid ¹	1.06 (0.59, 1.92)	0.845	1.14 (0.63, 2.07)	0.659
Iron ²	1.24 (0.98, 1.56)	0.077	1.41 (1.06, 1.89)	0.020
Calcium ³	0.65 (0.52, 0.81)	<0.001	0.62 (0.47, 0.81)	<0.001
Vitamin D ⁴	1.83 (1.42, 2.36)	<0.001	1.97 (1.51, 2.57)	<0.001
	β (95% CI)	p-value	β (95% CI)	p-value
Cumulative supplement use score ⁵	-0.23 (-0.60, 0.14)	0.230	-0.40 (-0.79, -0.01)	0.043

OR: Odds Ratio; aOR: adjusted Odds Ratio

B: Beta coefficient

CI: Confidence Interval

Adjusted for:

¹age, education, vomiting, gravida, smoking among spouses, and intake of savory snacks

²age, occupation, vomiting, BMI, smoking among spouses, and intake of savory snacks and carbonated beverages

³vomiting, gravida, smoking among spouses, and intake of carbonated beverages and coffee

⁴vomiting, gravida, smoking among spouses, and intake of carbonated beverages

⁵age, occupation, vomiting, smoking among spouses, and intake of home-cooked meals, savory snacks, and carbonated beverages

Conclusion and Implications

- Personalized mHealth intervention significantly improved iron and vitamin D supplement use.
- Increased mobile and internet use in Pakistan makes mHealth a convenient, affordable tool for improving pregnancy health behaviors.
- Encouraging adequate diet and micronutrient supplements are essential to improve perinatal outcomes and prevent complications.

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Thank You