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Economic Evaluation of Learning Through Play Plus (LTP+)

A Cost-Effectiveness Analysis Alongside the ROSHNI-PK Cluster Randomised Controlled Trial in Pakistan

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Supporting Mothers | Strengthening Children | Building Communities | Promoting Wellbeing

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- No relevant conflicts of interest to disclose.

Introduction and Background

- Approximately 17% of women worldwide experience postnatal depression, with the burden being even greater in low- and middle-income countries. In South Asia, the prevalence is estimated at 22.3%, highlighting a major public health challenge.

- Maternal depression affects not only mothers' mental health and quality of life but also increases the risk of poor cognitive, emotional, and social development in their children, creating long-term consequences for families and society.

- Despite the high burden, many women in Pakistan remain untreated because of limited specialist mental health services, stigma, poverty, and barriers to accessing healthcare.

- Learning Through Play Plus (LTP+) is an integrated community-based intervention that combines Cognitive Behavioural Therapy (CBT) with parenting and child development support, delivered by trained Community Health Workers.

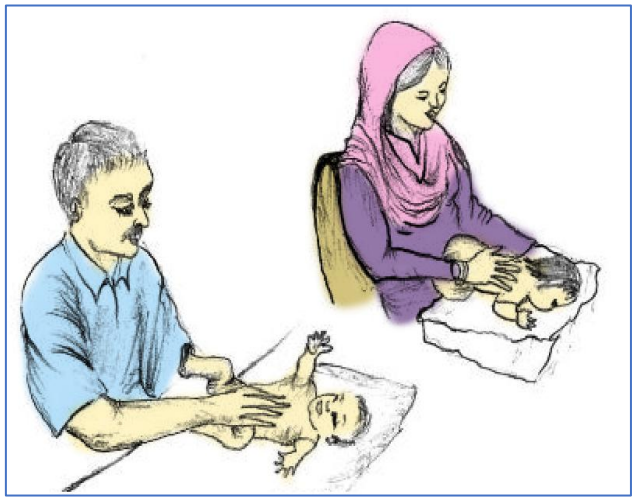
- Although LTP+ has demonstrated clinical effectiveness, evidence on whether it provides good value for money has been scarce, particularly in low-resource settings where healthcare resources are limited.

- This study evaluated the cost-effectiveness of LTP+ compared with Treatment As Usual (TAU) alongside the ROSHNI-PK cluster randomised controlled trial to inform evidence-based mental health policy and resource allocation in Pakistan.

Intervention

- Learning Through Play Plus (LTP+) integrates Cognitive Behavioural Therapy (CBT) with parenting and early child development support to improve maternal mental health and child socio-emotional outcomes.

- The intervention comprises 10 structured group sessions delivered over 3 months by trained Community Health Workers under the supervision of psychologists, making it suitable for resource-limited settings.



Methods

- This economic evaluation was conducted alongside the ROSHNI-PK cluster randomised controlled trial in Karachi, Pakistan, with a 6-month follow-up period.
- The study included 764 mothers aged 18–44 years with postnatal depression and children aged 0–30 months, who were randomised to receive either LTP+ plus Treatment As Usual (TAU) or TAU alone.
- The economic evaluation was undertaken from the healthcare, social care, and patient/family perspective, incorporating intervention delivery costs and healthcare resource use.
- Health outcomes were assessed using EQ-5D-3L to estimate maternal quality-adjusted life years (QALYs), while clinical effectiveness was measured using the Edinburgh Postnatal Depression Scale (EPDS) and the Ages and Stages Questionnaire: Social-Emotional (ASQ).
- Costs and outcomes were analysed using generalised linear mixed-effects models, adjusting for baseline characteristics and clustering.
- Incremental Cost-Effectiveness Ratios (ICERs), bootstrapping, cost-effectiveness planes, and cost-effectiveness acceptability curves were used to evaluate uncertainty and estimate the probability that LTP+ was cost-effective compared with TAU.

Results

- The delivery cost of LTP+ was approximately US$69 per mother–child dyad, representing a relatively low-cost community-based intervention.
- Compared with Treatment As Usual (TAU), LTP+ improved maternal quality of life, increased recovery from postnatal depression, and enhanced child socio-emotional development.
- The incremental cost-effectiveness ratio (ICER) was US$258 per maternal QALY gained (dyad analysis) and US$582 per maternal QALY gained (mother-only analysis).
- LTP+ cost US$29 per mother–child dyad recovered and US$80 per mother recovered, demonstrating favourable cost-effectiveness.
- Sensitivity analyses showed that the findings were robust across multiple assumptions, with LTP+ remaining highly likely to be cost-effective compared with TAU.

Results

Table 1 The start up and recurrent costs of LTP+ intervention (in 2015 Pakistani rupees*)

Cost heads	Unit cost**	Quantity	Total cost**
Training and development of CHWs			
Set-up (non-recurrent) costs			
Travel cost	3200 per visit	10 visits	32,000
Project lead wage	240 per hour	80 h	19,231
Senior research psychologist wage	168 per hour	80 h	13,462
Community supervisor/guider wage	48 per hour	80 h	3846
Manual and calendar development			
Culturally adapted manual development (English)	6206 per manual	143 manuals	887,458
Culturally adapted manual development (Urdu)	6206 per manual	110 manuals	682,660
Sketches of calendar	500 per calendar	59 calendars	29,500
Total set-up cost			1,668,157
Per participant set-up cost			4150 (402 participant)
Recurrent/delivery cost			
LTP+ intervention delivery stage			
Travel cost (transportation)	3200 per visit	360 visits for 720 sessions	1,152,000
Travel cost revisits (transportation)	3200 per visit	72 visits	230,400
Wage (delivering sessions)			
Junior research assistant for delivering intervention	120 per hour	540 h	64,904
Senior research psychologist	168 per hour	540 h	90,865
Project lead office and community work	240 per hour	540 h	129,808
Community supervisor/guider	48 per hour	540 h	25,962
Wage (preparation and travelling for sessions)			
Junior research assistant for delivering intervention^	120 per hour	743 h	89,303
Senior research psychologist^	168 per hour	743 h	125,024
Project lead office and community work (100%)	240 per hour	743 h	178,606
Other Resources			
Rent for acquiring clinic	200 per session	720 sessions	144,000
Babysitter/Aya	50 per participant	402 participants	20,100
Printing			
LTP calendar	700 per calendar	750 calendars	525,000
LTP manual	5 per manual	506 manuals	2530
Monetary incentives			
Monetary incentive paid to participants	300 per participant	402 participants	120,600
Total delivery cost			2,899,102
Per participant delivery cost			7212 (402 participant)
Per participant cost (set-up plus delivery)			11,361 (402 participant)

Notes: LTP+, Learning Through Play Plus; CHW, community health worker; Rs., Pakistani rupees. *Due to small numbers, all the data are presented in 2015 Pakistani rupees instead of being converted to US dollars (Rs. 105/$1 in 2015). **The unit costs and total costs are rounded to the nearest whole number. ^The junior research assistant and senior research psychologist were community health workers and supervisors

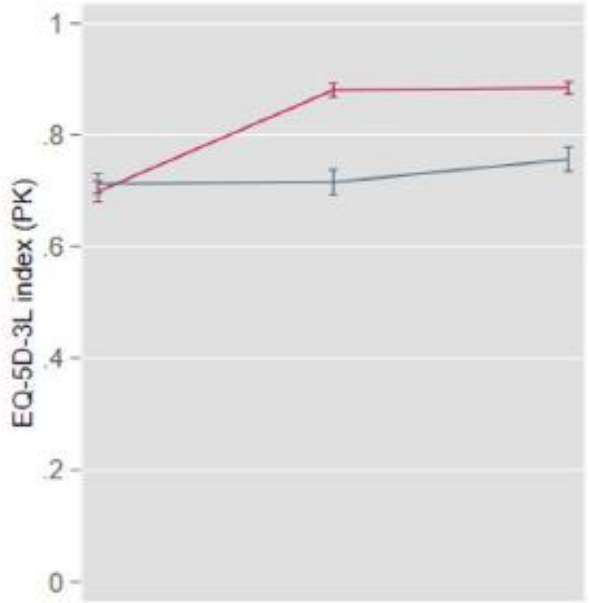
Results

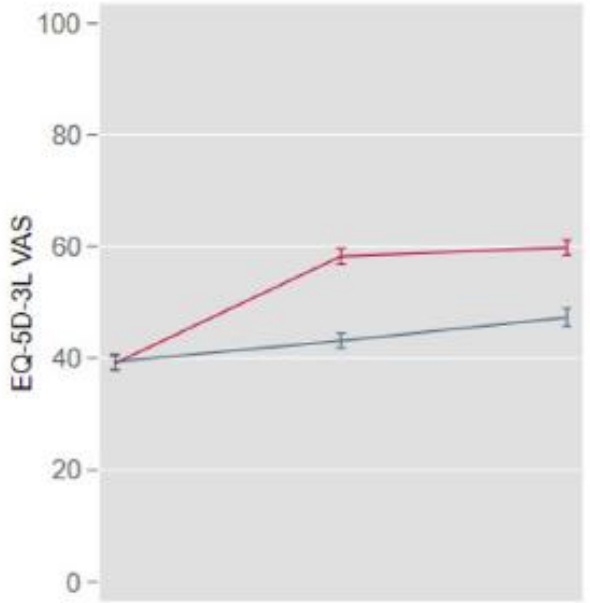
Table 2 Base case average and incremental costs (2015 US $), effects, and ICER

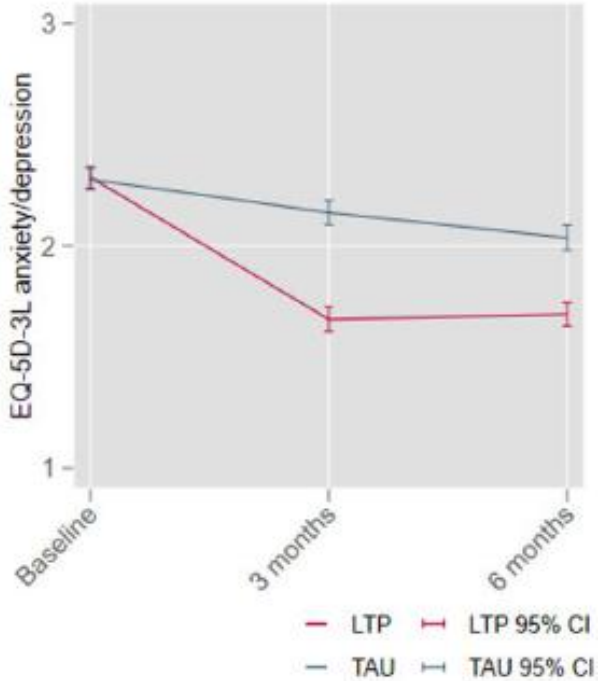
Unadjusted statistics	Dyad healthcare cost	Intervention cost	Mother QALYs	Participants
Control group (TAU) (mean)	$158	.	0.36	368
Intervention group (LTP+) (mean)	$105	$69	0.42	396
Adjusted analyses	Cost (CI)	Effects (CI)	ICER (CI)	Participants
	Dyad Cost	Mother QALY		
Control (TAU)	$153 ($145: $161)	0.36 (0.35: 0.37)	…	368
Intervention (LTP+)	$168 ($165: $178)	0.42 (0.41: 0.42)	…	396
Difference	$15 ($4: $25)	0.060 (0.05:0.07)	$258 ($75: $442) per QALY gained	764
	Mother Cost	Mother QALY		
Control (TAU)	$110 ($103: $117)	0.36 (0.35: 0.37)	…	368
Intervention (LTP+)	$143 ($137: $149)	0.42 (0.41: 0.42)	…	396
Difference	$33 ($24: $43)	0.06 (0.05: 0.07)	$582 ($404: $769) per QALY gained	764
	Dyad Cost	Dyad recovery		
Control (TAU) (11/367)*	$153 ($145: $161)	0.02 (0.01: 0.03)	…	367
Intervention (LTP+) (218/395)*	$168 ($162: $175)	0.55 (0.51: 0.60)	…	395
Difference	$16 ($6: $26)	0.54 (0.49: 0.59)	$29 ($11: $49) per dyed recovered	762
	Mother Cost	Mother recovery		
Control (TAU) (124/367)*	$110 ($103: $117)	0.28 (0.23: 0.33)	…	367
Intervention (LTP+) (261/395)*	$143 ($137: $149)	0.70 (0.65: 0.75)	…	395
Difference	$33 ($24: $42)	0.42 (0.34: 0.50)	$80 ($53: $111) per mother recovered	762

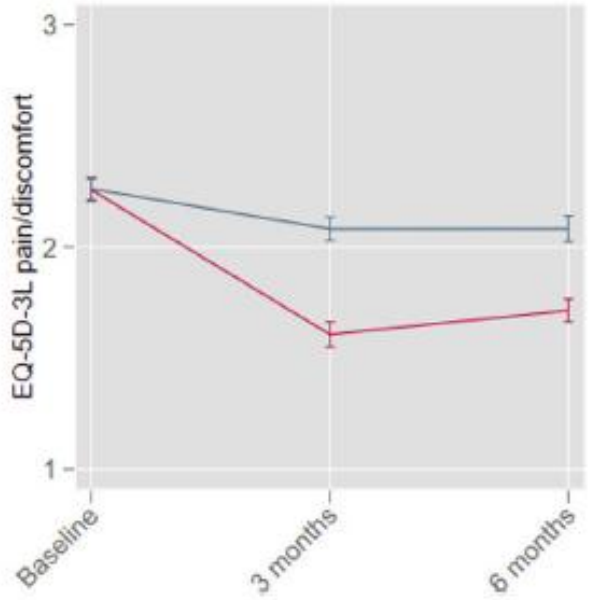
Notes: CI, confidence interval; ICER, incremental cost effectiveness ratio; QALY, quality-adjusted life year; TAU, treatment as usual; LTP+, learning through play plus; US, United States. *The numbers in brackets provide the recovery ratios in the trial arms. 1. Cost includes LTP+ delivery costs, all healthcare use costs of mother and out of pocket healthcare use cost for the child. 2. The 95% CIs are the percentile bootstrap confidence intervals (10,000 replications). 3. Dyad recovery is measured by a binary indicator (equals 1 when mother depression score and child socio-emotional development scores are in normal range, zero otherwise). 4. The adjusted analyses control for baseline health states (or recovery scores), family size and income, mother and child age, mother education, housing type, and include cluster-level random intercepts

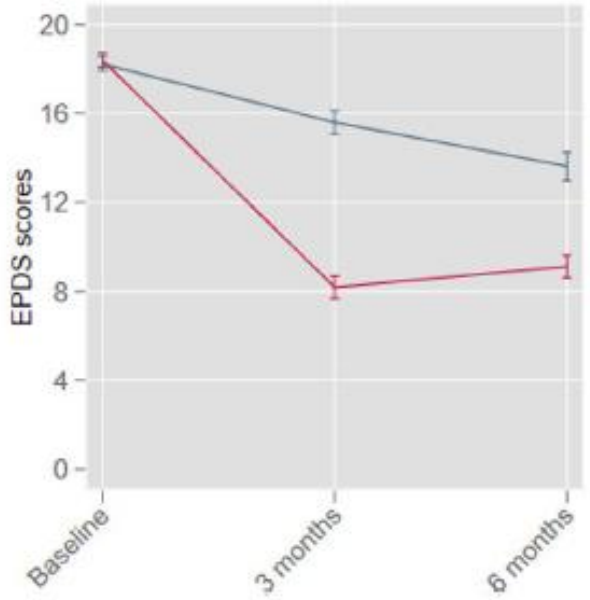
Results


EQ-5D-3L index (PK)
0
.2
.4
.6
.8
1


EQ-5D-3L VAS
0
20
40
60
80
100


EQ-5D-3L anxiety/depression
1
2
3
Baseline
3 months
6 months
LTP
LTP 95% CI
TAU
TAU 95% CI


EQ-5D-3L pain/discomfort
1
2
3
Baseline
3 months
6 months


EPDS scores
0
4
8
12
16
20
Baseline
3 months
6 months

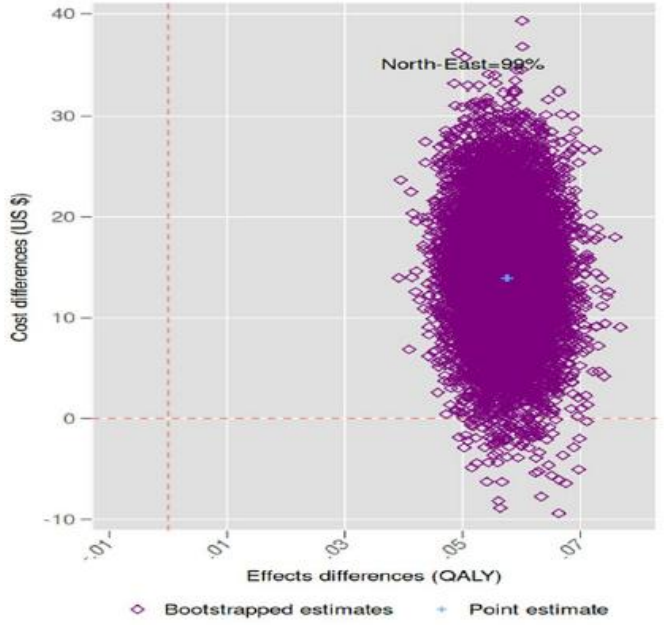
Results

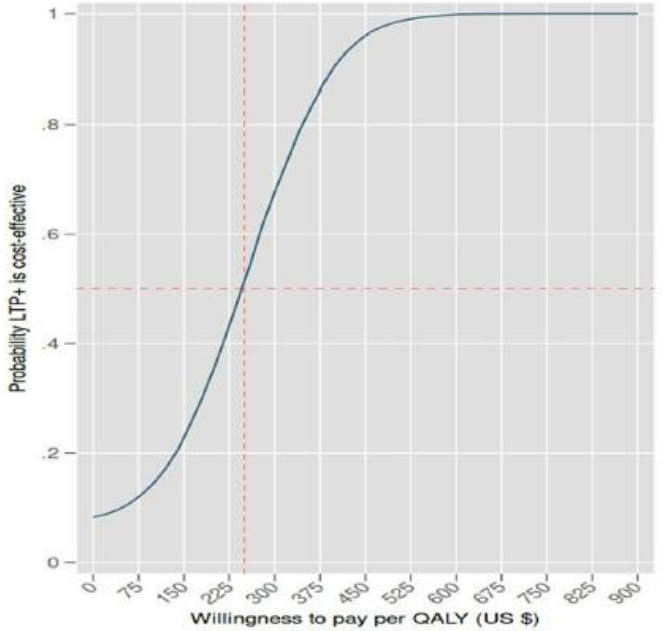
Table 3 Sensitivity analysis (costs in 2015 US $, all analyses control for baseline characteristics)

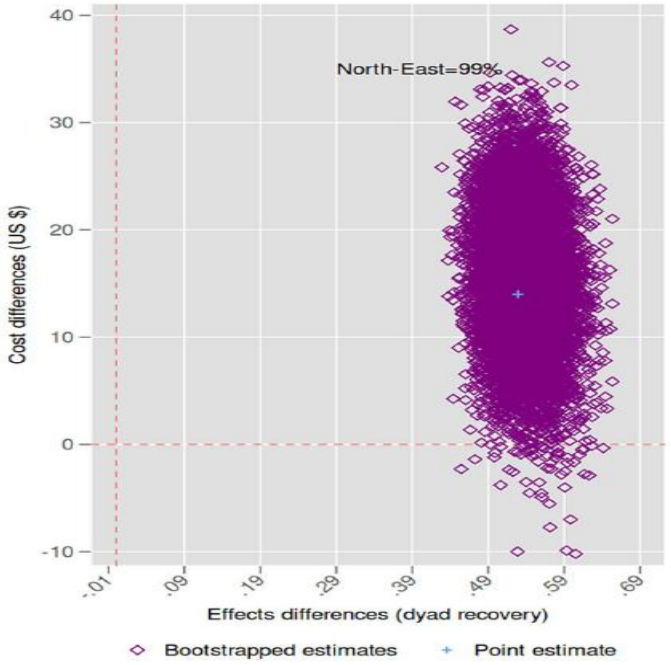
Scenario1	Scenario2	Dyad Cost (CI)	Effects (CI)	ICER (CI)	*N*
Outcome measure is same as in Table 2	Blank if not different from Table 2				
Mother QALY	Include Rs. 300 LTP+ attendance costs	$19 ($9: $29)	0.060 (0.05:0.07)	$312 ($129: $499) per QALY gained	764
Mother QALY	Also include set-up cost of LTP+	$57 ($46: $68)	0.06 (0.05: 0.07)	$1,005 ($775: $1,261)	764
Dyad recovery	Also include set-up cost of LTP+	$58 ($48: $68)	0.53 (0.47: 0.57)	$111 ($88: $133)	762
Mother QALY	Use max unit cost from Table A1	$-2 (-$16: $13)	0.06 (0.05: 0.07)	dominant	764
Mother QALY	Use min unit cost from Table A1	$32 ($25: $38)	0.06 (0.05: 0.06)	$562 ($421: $717)	764
Mother QALY	Only baseline health state as control	$15 ($5: $24)	0.06 (0.05: 0.07)	$257 ($79: $441)	764
Outcome measure is different from Table 2					
At least partial dyad recovered		$13 ($3: $24)	0.66 (0.58: 0.73)	$20 ($5: $37)	762
EPDS + ASQ: SE scores		$12 ($1: $23)	-93.98 (-98.03: -89.91)	<$1 ($>0: <$1)	758

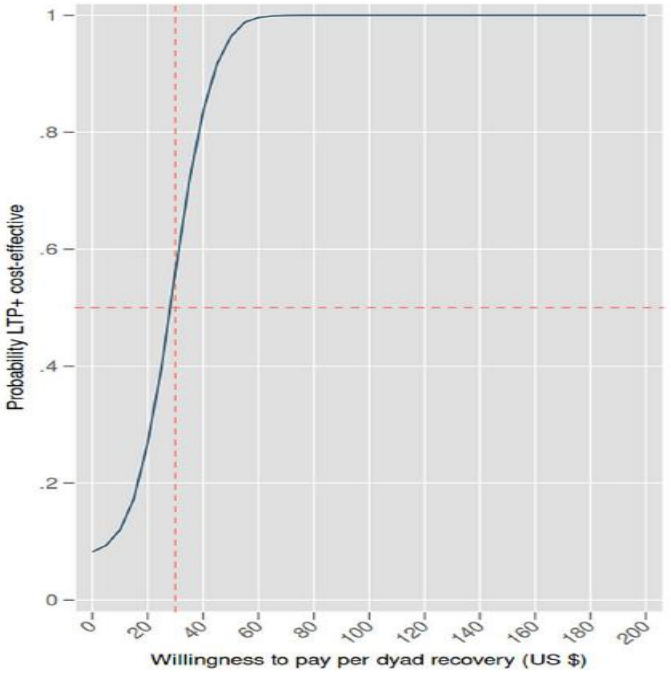
Notes: CI, confidence interval; ICER, incremental cost effectiveness ratio; QALY, quality-adjusted life year; EPDS, Edinburgh postnatal depression scale; ASQ: SE, ages and stages questionnaires: social-emotional; US, United States. 1. The 95% CIs are the percentile bootstrap confidence intervals (5,000 replications). 2. Dyad recovery is measured by a binary indicator (equals 1 when mother depression score and child socio-emotional development scores are in normal range, zero otherwise). 3. Partial dyad recovery is measured by a binary indicator (equals 1 when at least one of the dyad member scores are in normal range, zero otherwise). 4. Except one row, all analyses control for baseline health states (or recovery scores), family size and income, mother and child age, mother education, housing type, and include cluster-level random intercepts

Results


North-East=99%
Cost differences (US $)
Effects differences (QALY)
Bootstrapped estimates
Point estimate


Probability LTP+ is cost-effective
Willingness to pay per QALY (US $)


North-East=99%
Cost differences (US $)
Effects differences (dyad recovery)
Bootstrapped estimates
Point estimate


Probability LTP+ cost-effective
Willingness to pay per dyad recovery (US $)

Discussion and Conclusion

- Delivering LTP+ through trained Community Health Workers offers a scalable and affordable approach to addressing the treatment gap in maternal mental health, particularly in low- and middle-income countries.

- LTP+ provides good value for money and is highly likely to be cost-effective compared with usual care, supporting its integration into routine maternal and child health services.

- Scaling up community-based psychological and parenting interventions such as LTP+ could improve maternal and child health outcomes while making efficient use of limited healthcare resources.

Administrative Information

- **Acknowledgements**

We sincerely thank all study participants, Community Health Workers, field staff, supervisors, and collaborators for their valuable contributions to the ROSHNI-PK trial. We also acknowledge the Health Economists' Study Group (HESG) mentorship programme and the NIHR Applied Research Collaboration Greater Manchester (ARC-GM) for supporting the health economics training.

- **Funding**

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- **Data Availability**

The datasets generated and analysed during this study are available from the corresponding author upon request.

- **Ethics Approval and Consent to Participate**

Ethical approval was obtained from the Ethics Committee of Karachi Medical and Dental College (Ref: 0019/13). Written informed consent was obtained from all participants before enrolment, and participation was voluntary.

Learning Through Play Plus Dads (LTP+ Dads)

Partner inclusive culturally adapted low-cost group parenting programme for depressed fathers: Transition to scale in 23 million population.

Building on the Roshni PK (LTP) trial funded by Grand Challenges Canada in 2020

WHY THIS MATTERS

- Many families in Pakistan face poverty, low literacy and limited access to mental health care.
- Postnatal depression affects mothers, children and the whole family.
- Fathers play a critical role in child development and family well-being, yet paternal depression is under-recognized and untreated.
- LTP+ Dads engages both parents to improve parenting, reduce depression and strengthen families.

LTP+ DADS INTERVENTION

- Cognitive Behavioural Therapy (CBT) for depressed fathers
- Parenting and play activities to support child development
- 12 group sessions (2x per week for 2 months) + 2 monthly booster sessions
- Delivered by trained Community Health Workers in the home or community setting
- Partners (mothers) invited to optional parallel add-on sessions

STUDY DESIGN

- Cluster Randomised Controlled Trial (LTP+ Dads vs Usual Care)
- 4 districts of Karachi (urban, low-resource communities)
- Two arms:
  - LTP+ Dads intervention
  - Usual care
- Follow-up at baseline, 3 months and 6 months

SAMPLE

Total sample: **900 families**

Inclusion Criteria

- Fathers aged 18+ with EPDS ≥10
- Partner (mother) and child aged 0–36 months
- Living in selected clusters
- Planning to stay in area for next 6 months

OUTCOMES MEASURED

For Fathers
- Depression (EPDS)
- Parenting stress
- Co-parenting quality
- Harsh parenting
- Health-related quality of life (QALYs)

For Mothers
- Depression (EPDS)
- Parenting stress
- Health-related quality of life (QALYs)

For Children (0–36 months)
- Socio-emotional development (ASQ:SE)
- Stimulation in home environment
- Health and growth indicators

EXPECTED IMPACT

- Reduced depression in fathers and mothers
- Improved parenting practices and co-parenting
- Better social, emotional and cognitive development in children
- Reduced family stress and improved well-being
- Cost-effective, scalable solution for 23 million population

PATH TO SCALE

- Delivered through existing primary health care and Lady Health Worker network
- Culturally adapted, low-cost manualized programme
- Capacity building and supervision of CHWs
- Evidence to inform scale-up and policy for national implementation

LTP+ Dads aims to break the intergenerational cycle of mental health problems by supporting both parents and nurturing early child development.

Thank you!

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