

Original Research Article

Impact of breastfeeding on the intelligence quotient of the children of Rawalpindi, Pakistan

Shahrukh Khan¹, Syeda Nayab Fatima², Muhammad Aslan Munir³, Fizza Yousaf⁴,
Wajeeda Kaynat⁵, Maha Ishfaq¹, Maida Khadim¹, Tayyab Mumtaz Khan^{6*},
Junaid Abid⁷, Jehanzeb Akram⁸

¹University of Veterinary and Animal Sciences, Lahore, Pakistan

²Nestle Pakistan Ltd, Pakistan

³Riphah International University, Islamabad, Pakistan

⁴Imran Idrees Institute of Rehabilitation Sciences, Sialkot, Pakistan

⁵University of Management and Technology, Sialkot, Pakistan

⁶Rawalpindi Medical University, Rawalpindi, Pakistan

⁷Department of Food Science and Technology, University of Haripur, Pakistan

⁸Punjab Rangers Teaching Hospital, Lahore, Pakistan

Received: 22 April 2023

Revised: 21 May 2023

Accepted: 22 May 2023

*Correspondence:

Dr. Tayyab Mumtaz Khan,

E-mail: tayyab.mkhan98@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Breastfeeding impacts the children physical and mental growth and development. The impact of breastfeeding on intelligence quotient (IQ) of children is under-researched in Pakistan. This study aimed to determine the impact of breastfeeding on the intelligence quotient among children of Rawalpindi, Pakistan.

Methods: This comparative cross-sectional was performed among 88 children of the Rawalpindi. Patients' enrolment in the study was done via non-probability convenient sampling and developed inclusion and exclusion criteria. Ethical approval and informed consent were taken. Intelligence quotient was calculated through Wechsler intelligence scale for children (WISC). Data analysis was done via descriptive and inferential statistics by statistical package for the social sciences (SPSS) version 25. Chi square test was used to assess the variables association. P value less than 0.05 was set as statistically significant.

Results: The overall mean score on WISC of intelligence quotient was 106 with SD of ± 39 , whereas, mean score of intelligence quotient for breastfed children was 112 with SD of ± 32 and mean score of intelligence for children who were on formula milk was 100 with SD of ± 36 . The association between the type of milk and intelligence quotient ($p=0.003$) and association between duration of breastfeeding and intelligence quotient ($p=0.04$) was statistically significant.

Conclusions: Children who had been on breastfeeding had better IQ. Furthermore, children who were breastfed for longer duration had even better IQ than children who were on breastfeeding for shorter duration.

Keywords: Breastfeeding, Children, Impact, Intelligence quotient, Rawalpindi

INTRODUCTION

Breastfeeding is essential for proper growth and immunity of children. It has both short-term and long-term effects on the physical and mental growth of the

children.¹ Short term influence of breastfeeding is protectiveness against various gastrointestinal and respiratory infections, and allergies. This protection leads to lesser mortality rate among the breastfed children in comparison to non-breastfed children.²

Long-term impact of breastfeeding is on the development of the brain and consequently intelligence quotient (IQ).³ All over the world, various studies in the literature have shown that the children who were breastfed had better IQ score on IQ assessment tools in contrast to the children who were not breastfed or were on some formula milk.^{4,5} Furthermore, a study has also shown that breastfeeding duration also does matter and children with longer duration of breastfeeding had better IQ score than children with shorter duration of the breastfeeding.⁶ Consequently, academic performance was good among children who were on breastfeeding, and even the higher education levels among adolescence were higher in adulthood.^{1,7}

Different mechanisms have been suggested through which breastfeeding impact the brain growth and resultantly the intelligence quotient among children. It has been shown that children who were breastfed revealed greater grey matter volume in various lobes of the brain such as in the left and right parietal and left temporal lobes and higher stimulating power in the right frontal and temporal lobes for the sense of perception duties, while for the speaking function, the stimulating power was greater in the left temporal lobe. Furthermore, it has been also presented that the volume of the subcortical grey matter interceded the relationship between breastfeeding and cognitive function.^{8,9} As the breast milk has higher amount of long-chain polyunsaturated fatty acids, such as arachidonic acid and docosahexaenoic acid and these are needed for the development of the brain during childhood. So, this could be the reason of favorable influence of breastfeeding on the children intelligence.^{5,10}

Around the globe, breastfeeding and intelligence quotient among the children is well studied, however, this topic could not get the spotlight that it should have, therefore, our study aimed to determine the influence of breastfeeding on the intelligence of children in Rawalpindi, Pakistan. It could help general public in understanding the importance of breastfeeding.

METHODS

This comparative cross-sectional was carried out in a general population of children of the Rawalpindi, Pakistan, for approximately 8 months from June 2022 to January 2023. Sample size was 88. WHO calculator was used to calculate the study sample size. 44 children were on breastfeeding, whereas, other 44 children were on formula milk. Patients' enrolment in the study was done via non-probability convenient sampling and developed inclusion and exclusion criteria. Only those children who had, an age range between 7 to 12 years, no diagnosed physical and psychological disorders, and who had been on only either on breastfeed, or on formula milk, were selected in the study, while, those who had, age below 7 years or above 12 years, any physical or psychological

disorders, and who had been on both breastfeeding and formula milk, were not included in the study.

Ethical approval and informed consent were taken before the start of the study and before the data collection, respectively.

Data was collected through a self-designed questionnaire. This questionnaire had two elements. First was about the socio-demographic characteristics and type of milk children took after birth. Socio-demographic features such as gender (male or female) and age. Milk portion has two further parts which were about type of milk and duration of the milk after birth. Two types of the milk which such as breast milk and formula milk were included. Regarding duration of any type of milk was divided into less than 6 months and more than 6 months. Whereas, the second portion was regarding the Intelligence assessment of the children. It was assessed by using Wechsler intelligence scale for children (WISC). Children were classified into seven classes based on their intelligence which was determined via the composite score range on WISC. These classes included children with extreme high (130 or above), very high (120-129), high average (110-119), average (90-109), low average (80-89), very low (70-79), and extreme low (69 and below). After completing the data collection, data analysis was performed via descriptive and inferential statistics by statistical package for the social sciences (SPSS) version 25 (Armonk, NY: IBM Corp.). The frequency and percentage of nominal data calculated, while means of numerical data were determined. Chi Square test was used to assess the association between milk type and intelligence. P value less than 0.05 was set as statistically significant.

RESULTS

Out of 88 participants, 54 (61.36%) were male children, while 34 (38.64%) were female children. The mean of age for the study population was 9.83 years with standard deviation (SD) of ± 2.10 years. The overall mean score on WISC of intelligence quotient was 106 with SD of ± 39 , Whereas, mean score on WISC of intelligence quotient for breastfed children was 112 with SD of ± 32 and mean score on WISC of intelligence for children who were on formula milk was 100 with SD of ± 36 .

Table 1 shows that the breastfed children had relatively higher intelligence quotient classes on WISC in comparison to children who were on formula milk. Furthermore, it also shows that the association between intelligence quotient and type of milk was significant.

Table 2 indicates that the breastfed children who had been on breastfeeding for longer duration had higher classes of WISC than the breastfed children who had been on breastfeeding for shorter duration. Moreover, it also elaborates that the relationship between the intelligence

quotient and duration of breastfeeding was statistically significant.

Table 1: Classes of children on WISC based on the type of milk.

Parameters Classes on WISC based on IQ	Type of milk (%)	
	Breast milk	Formula milk
Extreme high	5 (11.36)	2 (4.55)
Very high	8 (18.18)	3 (6.82)
High average	13 (29.55)	10 (22.73)
Average	15 (34.09)	18 (40.90)
Low average	2 (4.55)	4 (9.09)
Very low	1 (2.27)	5 (11.36)
Extreme low	0 (0.00)	2 (4.55)

Chi-square test p value for the assessment of association between type of milk and intelligence quotient was 0.003 and it was statistically significant.

Table 2: Classes of children on WISC based on duration of breastfeeding.

Parameters Classes on WISC based on IQ	Duration of breastfeeding (%)	
	Shorter	Longer
Extreme high	2 (4.55)	3 (6.82)
Very high	3 (6.82)	5 (11.36)
High average	5 (11.36)	8 (18.18)
Average	8 (18.18)	7 (15.90)
Low average	1 (2.27)	1 (2.27)
Very low	1 (2.27)	0 (0.00)
Extreme low	0 (0.00)	0 (0.00)

Chi-square test p value for the determination of relationship between duration of the breastfeeding and intelligence quotient was 0.04 and it was significant.

DISCUSSION

This study has brought a very interesting topic of childhood in the spotlight, the association between breastfeeding and intelligence quotient among children of Rawalpindi, Pakistan.

This study showed that the children who had been on the breastfeeding had higher mean score on the WISC 112 ± 32 , whereas, for children who were on formula milk had relatively lower mean score of 100 ± 36 . Similar finding has been presented a systemic review that was conducted in the Brazil.³ A Canadian study also supported this research finding of higher score of intelligence quotient among breastfed children.¹¹

It has been also noted that the association between the type of milk and intelligence quotient among children is statistically significant. Consistent finding about the association between type of milk and intelligence quotient was noted by another study in literature.¹ Similarly, a

study of United States of America presented alike impact of breastfeeding on the IQ of children.⁶

Impact of duration of the breastfeeding on intelligence was also observed in the study and this study suggested that longer the duration of breastfeeding, higher the WICS score or IQ. A Chinese study also endorsed that the higher intelligence association with longer breastfeeding duration.⁴ Another study of Denmark also recommended in their results that longer duration breastfeeding leads to better IQ level.¹²

Although this study has explained about the impact of type of milk and duration of breastfeeding on the IQ of children significantly, however, this study did not exclude the cofounders that could have impact the intelligence quotient among the children. These cofounders could be parents IQ levels, family/social environment, and socioeconomic background. These cofounders might have influenced the results of current study, so further research work is required that could exclude the impact of these cofounders. Furthermore, further research is also needed for the determination of the mechanism of the role of breastfeeding in the improvement of the intelligence quotient.

CONCLUSION

Breastfeeding has positive impact on the intelligence quotient of children. Children who were breastfed had better IQ than children were on formula milk. Duration of breastfeeding also influence the IQ of children, children who had been on breastfeeding for longer duration, had better IQ level than children who had been on breastfeeding for shorter duration. Health department should create awareness regarding the significance of breastfeeding among parents, so that children could achieve their full potential in their lives.

ACKNOWLEDGEMENTS

We would like to thank all participants who gave their precious time to us and who volunteered themselves for the study.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Horta BL, Loret de Mola C, Victora CG. Breastfeeding and intelligence: a systematic review and meta-analysis. *Acta Paediatr.* 2015;104:14-9.
2. Frank NM, Lynch KF, Uusitalo U, Yang J, Lönnrot M, Virtanen SM, et al. The relationship between breastfeeding and reported respiratory and gastrointestinal infection rates in young children. *BMC Pediatr.* 2019;19:1-2.

3. Bernardo H, Cesar V, World Health Organization. Long-term effects of breastfeeding: a systematic review. World Health Organ. 2013.
4. Hou L, Li X, Yan P, Li Y, Wu Y, Yang Q, et al. Impact of the duration of breastfeeding on the intelligence of children: a systematic review with network meta-analysis. *Breastfeed Med*. 2021;16(9):687-96.
5. Isaacs EB, Fischl BR, Quinn BT, Chong WK, Gadian DG, Lucas A. Impact of breast milk on intelligence quotient, brain size, and white matter development. *Pediatr Res*. 2010;67(4):357-62.
6. Plunkett BA, Mele L, Casey BM, Varner MW, Sorokin Y, Reddy UM, et al. Association of breastfeeding and child intelligence quotient score at age 5. *Obstet Gynecol*. 2021;137(4):561.
7. Victora CG, Barros FC, Horta BL, Lima RC. Breastfeeding and school achievement in Brazilian adolescents. *Acta Paediatr*. 2005;94(11):1656-60.
8. Horta BL, de Sousa BA, de Mola CL. Breastfeeding and neurodevelopmental outcomes. *Curr Opin Clin Nutr Metab Care*. 2018;21(3):174-8.
9. Holme A, MacArthur C, Lancashire R. The effects of breastfeeding on cognitive and neurological development of children at 9 years. *Child Care Health Develop*. 2010;36(4):583-90.
10. Koletzko B, Lien E, Agostoni C, Böhles H, Campoy C, Cetin I, et al. The roles of long-chain polyunsaturated fatty acids in pregnancy, lactation and infancy: review of current knowledge and consensus recommendations. *J Pediatr Med*. 2008;36(1).
11. Kramer MS, Aboud F, Mironova E, Vanilovich I, Platt RW, Matush L, et al. Breastfeeding and child cognitive development: new evidence from a large randomized trial. *Arch Gen Psychiatr*. 2008;65(5):578-84.
12. Beck IH, Bilenberg N, Davidsen KA, Rasmussen AA, Boye H, Jensen TK. Prenatal and early childhood predictors of intelligence quotient (IQ) in 7-year-old Danish children from the Odense Child Cohort. *Scand J Public Health*. 2022;14034948221077463.

Cite this article as: Khan S, Fatima SN, Munir MA, Yousaf F, Kaynat W, Ishfaq M, et al. Impact of breastfeeding on the intelligence quotient of the children of Rawalpindi, Pakistan. *Int J Community Med Public Health* 2023;10:2399-402.