






Abstract

Maternal Breast Growth and Body Mass Index in Relation to Milk Production [†]

Xuehua Jin ^{1,2,3} , Ching Tat Lai ^{1,2,3} , Sharon L. Perrella ^{1,2,3} , Jacki L. McEachran ^{1,2,3} , Zoya Gridneva ^{1,2,3} 
and Donna T. Geddes ^{1,2,3,*}

¹ School of Molecular Sciences, The University of Western Australia, Crawley, WA 6009, Australia; xuehua.jin@research.uwa.edu.au (X.J.); ching-tat.lai@uwa.edu.au (C.T.L.); sharon.perrella@uwa.edu.au (S.L.P.); jacki.mceachran@uwa.edu.au (J.L.M.); zoya.gridneva@uwa.edu.au (Z.G.)

² ABREAST Network, Perth, WA 6000, Australia

³ UWA Centre for Human Lactation Research and Translation, Crawley, WA 6009, Australia

* Correspondence: donna.geddes@uwa.edu.au

[†] Presented at the Australian Breastfeeding + Lactation Research and Science Translation Conference (ABREAST Conference 2023), Perth, Australia, 10 November 2023.

Keywords: lactation; human milk; milk production; body mass index; breast volume; breast growth

Low milk production poses a substantial challenge to exclusive and continued breastfeeding, which affects 10–15% of lactating mothers. This study aimed to explore the relationships between MP and both the maternal body mass index (BMI) and changes in breast volume during pregnancy and lactation.

Lactating mothers at 1–6 months postpartum conducted 24 h MP measurements using the test weighing method ($n = 316$; 74—low milk production (LMP), <600 mL; 242—normal milk production (NMP), ≥ 600 mL). Demographic and obstetric data, including maternal age, parity, infant sex, and birth mode, as well as pre-pregnancy and postpartum body mass index (BMI) and bra size, were provided. Maternal breast volume (cm^3) was calculated based on both bra cup size and band size. Descriptive statistics, Student's *t*-test, two-proportion *z*-test, correlation analysis and multivariable linear regression models were applied to elucidate maternal factors related to milk production.

The 24 h milk production in the LMP group was 466 ± 120 mL (80–599 mL) and 850 ± 191 mL (601–1682 mL) in the NMP group ($p = 0.001$). No significant differences were found between the groups in pre-pregnancy BMI, postpartum BMI, and BMI change (Δ BMI), as well as pre-pregnancy and postpartum breast volume, and breast volume increase (Δ breast volume). Both pre-pregnancy and postpartum BMI were positively correlated with pre-pregnancy and postpartum breast volume ($r = 0.59$ – 0.67 , $p = 0.001$, for all). There was a higher proportion of mothers with Δ breast volume < 200 cm^3 in the LMP group compared with the NMP group (63% (41/65) vs. 45% (91/204), respectively, $p = 0.020$). There was no difference in milk production between the LMP groups with Δ breast volume < 200 cm^3 and Δ breast volume > 200 cm^3 . However, mothers in the LMP group with Δ breast volume < 200 cm^3 had lower milk production compared to both the NMP group with Δ breast volume < 200 cm^3 (mean difference \pm standard error: 379 ± 34 mL, $p < 0.001$) and NMP group with Δ breast volume > 200 cm^3 (414 ± 33 mL, $p < 0.001$). Similarly, the LMP group with Δ breast volume > 200 cm^3 had a lower MP compared to both the NMP group with Δ breast volume < 200 cm^3 (343 ± 42 mL, $p < 0.001$) and NMP group with Δ breast volume > 200 cm^3 (377 ± 41 mL, $p < 0.001$). In addition, mothers in the LMP group with Δ breast volume > 200 cm^3 had a higher postpartum BMI compared to both the NMP group with Δ breast volume < 200 cm^3 (mean difference 4.1 ± 1.5 , $p < 0.033$) and NMP group with Δ breast volume > 200 cm^3 (mean difference 4.6 ± 1.5 , $p < 0.011$).



Citation: Jin, X.; Lai, C.T.; Perrella, S.L.; McEachran, J.L.; Gridneva, Z.; Geddes, D.T. Maternal Breast Growth and Body Mass Index in Relation to Milk Production. *Proceedings* **2023**, *93*, 14. <https://doi.org/10.3390/proceedings2023093014>

Published: 22 December 2023



Copyright: © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

These preliminary results highlight the complex relationships between maternal BMI, increase in breast volume and 24 h milk production, and suggest that BMI and breast growth are potentially important indicators of milk production. Further investigations of these inter-related factors may inform interventions aiming at achieving normal milk production in women with higher adiposity.

Author Contributions: Conceptualization, X.J., C.T.L. and D.T.G.; methodology, C.T.L., J.L.M. and Z.G.; software, X.J. and C.T.L.; validation, X.J. and C.T.L.; formal analysis, X.J.; investigation, X.J. and C.T.L.; resources, S.L.P. and D.T.G.; data curation, X.J., C.T.L., J.L.M. and Z.G.; writing—original draft preparation, X.J.; writing—review and editing, C.T.L., S.L.P., Z.G. and D.T.G.; visualization, X.J.; supervision, C.T.L., S.L.P. and D.T.G.; project administration, D.T.G.; funding acquisition, D.T.G. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by an unrestricted research grant from Medela AG (Switzerland), by The University of Western Australia (UWA) and China Scholarship Council (CSC). C.T.L., S.L.P., J.L.M., Z.G. and D.T.G. receive salaries from an unrestricted research grant paid by Medela AG and administered by UWA. X.J. is supported by UWA—CSC Joint PhD Scholarship and UWA—CSC Higher Degree by Research Top-Up Scholarship. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki and was approved by the UWA Human Research Ethics Committee (2019/RA/4/20/4023).

Informed Consent Statement: Informed consent was obtained from all participants involved in the study.

Data Availability Statement: Data sharing is not applicable.

Acknowledgments: We are grateful to the families who participated in the study.

Conflicts of Interest: D.T.G. declares participation in the Scientific Advisory Board of Medela AG. C.T.L., S.L.P., J.L.M., Z.G., and D.T.G. are/were supported by an unrestricted research grant from Medela AG, administered by The University of Western Australia. The funders had no role in the design of the study; in the collection, analyses, or interpretation of data; in the writing of the manuscript; or in the decision to publish the results.

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.