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Research Category

Basic Science

Abstract Title

Changes in Colostrum Immune Protein Levels During Early Lactation in Pakistani Women From the Mumta Pregnant Women Trial

Background

Colostrum, the milk mothers produce within five days post-partum, protects newborns against infections and promotes immunological development. However, research on colostrum immune components is scarce due to short-lived production and limited volume during early lactation.

Objective

This project describes and compares colostrum immune proteins at Day-1 versus Day-3 post-partum, within a four-arm dietary/medication randomized controlled trial (RCT).

Methods

We accessed data from the Mumta Pregnant Women RCT in Pakistan, with four study groups: 1) Standard Antenatal Care (SAC, n=48); 2) SAC and balanced-energy-protein supplementation (BEP, n=49); 3) SAC, BEP, and azithromycin (n=49); and 4) SAC, BEP, nicotinamide and choline (n=51). Colostrum was collected from mother-infant dyads on Day-1 (n=162) and/or Day-3 (n=197) by manual expression (116 paired samples). Osteopontin, IgA, IgG, IgM, calprotectin, and lactoferrin were measured by Mesoscale Discovery assay. Statistical analyses were performed with Wilcoxon Rank, Kruskal-Wallis, and McNemar-Bowker tests. Calprotectin and lactoferrin were analyzed as tertiles due to measurement imprecision resulting from extremely concentrated proteins and high colostrum viscosity.

Results

All colostrum immune protein levels changed significantly from Day-1 to Day-3. Osteopontin increased 33-fold (Day-1 median=42.8ng/ml versus Day-3 1428.8ng/ml, $p<0.001$), whereas all immunoglobulins decreased, with a 3 to 4-fold drop in IgA (31.8g/L versus 7.8g/L, $p<0.001$), IgM (4.0g/L to 1.4g/L, $p<0.001$), and IgG (0.14g/L to 0.05g/L, $p<0.001$). Calprotectin and lactoferrin levels significantly decreased ($p<0.001$). These temporal patterns were similar across all study arms. Cross-sectionally, the only intervention effect detected was lower IgM in the group receiving BEP and azithromycin compared to controls at Day-1 (2.97g/L versus 5.25g/L, $p=0.013$).

Conclusion

Immune protein concentrations shift considerably during the first three days post-partum, with each protein following a distinct temporal pattern that was consistent across intervention groups. Further research is necessary to understand the determinants of these changes during early lactation and effects on newborn infection risks and immune modulation.

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