Measuring age interaction with pesticide exposure during pregnancy and low-birth-weight: A hospitalbased retro-prospective cohort study in Chitwan, Nepal Approved by Ethical Review Board

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Ensuring Health as Right and Responsibility of Nepali People.

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Background and Objective

- Pregnant women who are exposed to pesticides can have complications with birth issues like giving birth to a child with low birth weight, birth abnormalities, short gestational length and preterm birth.
- Young pregnant women in Nepal are exposed to chemical pesticide because of its widespread use, and a phenomenon called "Feminization of Agriculture" where female farmers have outnumbered the male because of latter's outmigration.
- The objective of this study was to measure the effect of pesticide exposure during pregnancy on low-birth-weight (LBW) babies in young mothers and to assess interaction between maternal age and pesticide exposure.



Methodology



Sample

Sampling Method: All Pregnant mother exposed to pesticide during pregnancy and a random sample of pregnant mother not exposed to pesticide during pregnancy taken in the ratio of 1:8.

Size: Data Data **Collection Technique: Collection Tools:** The ratio of 1201 pregnant sample size, women were exposed: recruited for the unexposed =study. **Exposure:** Face-to-Structured 1:8 face interview questionnaire Sample **Outcome:** Hospital through NAXA size(n): 976 registry digital app

Description About the study participants

| | Variable | Frequency (N) |
|---|---|------------------|
| 1 | Total respondents in the study | 1201 |
| 2 | Total low birth weight babies | 108 |
| 3 | Total respondents exposed to pesticides | 135 |

RESULTS





Age of respondent n=1201



Fig 1: Age of respondents in years

Fig 2: Education level of the respondents

Occupation of respondents n = 1201



Fig 4: Occupation of respondents

Monthly Income(in '000) n = 1201



Fig 3: Family income of respondents

Crude risk ratio of total pesticide exposure and low birth weight

| Variables | LBW | Normal | Risk | P- | 95% Confidence |
|-----------------------|----------|----------|-------|-------|----------------|
| | | | Ratio | value | Interval |
| Exposed (Below 20) | 17 | 118 | | | |
| | (12.59%) | (87.41%) | 1.48 | 0.12 | 0.907 - 2.398 |
| Unexpose d | 91 | 975 | | | |
| (>20 year) | (8.54%) | (91.46%) | | | |

The risk of pregnant women giving birth to low-birth-weight babies is **1.48 times i.e. 48% higher** in women exposed to pesticide during pregnancy compared to women who weren't exposed to pesticide during pregnancy.



The possible confounders affecting low birth weight and pesticide exposure were: (Independent risk factors associated with exposure variable)

Note: We did not include age as a confounder or control for it in the model because we are examining how age interacts with the relationship between pesticide exposure and low birth weight.

1. Education

- 2. Female occupation
- 3. Family occupation
- 4. Family Income
- 5. Current Complication
- 6. Parity
- 7. BMI



Adjusted risk ratio of total pesticide exposure and low birth weight

The risk of pregnant women giving birth to low-birth-weight babies is **1.26 times higher** in women exposed to pesticide during pregnancy compared to women who weren't exposed to pesticide during pregnancy after adjusting possible confounders

| Variable | Adjusted Risk Ratio | p-value | CI |
|--|------------------------|---------|-------------|
| Pesticide Exposure Yes No | 1.26 Ref | 0.39 | 0.738– 2.15 |

STUDY OF AGE CATEGORY

| | | Low birth | Risk | | |
|--------------------|----------|------------|--------|---------|--------|
| Variable | Normal | weight | ratio | P-value | CI |
| | | Age | | | |
| | | | | | |
| Less than equal to | 127 | | | | 1.58 - |
| 20 | (81.94%) | 28(18.06%) | (2.36) | 0.00 | 3.50 |
| | | | | | |
| | 966 | | | | |
| More than 20 | (92.35%) | 80 (7.65%) | Ref | | |

The risk of low birth weight in young pregnant women (<=20yrs) is 2.36 times (136%) higher compared to age group more than 20yrs.

Age below or equal 20 years

| | Normal | Low Birth Weight | Risk | Risk ratio | P-Value | CI |
|---------------|---------------------|---------------------|------|---------------|---------|------------|
| Exposed | 14 (70%) | 6 (30%) | 0.3 | 1.84 | 0.13 | 0.85- 3.97 |
| Unexpose d | 113 (83.70%) | 22(16.30%) | 0.16 | | | |

The risk of giving birth to low birth weight pregnant women aged below 20 years was **1.84 times higher** in women exposed to pesticides during pregnancy as compared to women not exposed to pesticides during pregnancy

| Age >20 years | | | | | | | |
|---------------|-----------------|---------------------|------|------------|-------------|----------|--|
| | Normal | Low Birth Weight | Risk | Risk ratio | P- Value | CI | |
| Exposed | 104(90.43%) | 11(9.5%) | 0.09 | 1.29 | 0.41 | 0.7-2.36 | |
| Unexposed | 862 (92.5%) | 69 (7.4%) | 0.07 | | | | |

The risk of pregnant women aged > 20 years giving birth to low birth weight was **1.29 times higher** in women exposed to pesticides during pregnancy as compared to women not exposed to pesticides during pregnancy.

Comparison of younger age group mother exposed to pesticide and older age group not exposed to pesticide

| | Normal | Low Birth Weight | Risk | Risk ratio | P-Value | CI |
|------------|---------|---------------------|-------|------------|---------|-----------|
| Exposed | 14 | 6 (30%) | 0.3 | | | |
| (Below 20) | (9.57%) | | | 4.05 | 0.0002 | 1.99-8.20 |
| Unexposed | 862 | 69 | 0.074 | | | |
| (>20 year) | (16.3%) | (7.41%) | | | | |
| | | • | | | | |

Young pregnant women (<=20yrs) exposed to pesticide have 305% higher risk of delivering a LBW baby compared to unexposed older pregnant women (>20yrs) (RR=4.05, 95% CI- 1.99,8.20).

* 70% of low birth weight babies among the young pregnant women exposed to pesticide are attributed to the young maternal age. [(0.3-0.09)/0.3] x100 = 70%

Interaction of Maternal Age with Pesticide effect on LBW

- We measured both absolute excess risk of interaction and relative excess risk of interaction.
- Relative excess risk of interaction RERI=1.56 (calculated as:
 [RR (A+B+)-RR(A-B-)] [{RR(A+B-)-RR(A-B-)}+{RR(A-B+)-RR(A-B-)}] = [(4.05-1) - {(1.29-1) + (2.2-1)}])

☆Among young mothers (≤20 years) exposed to pesticides during pregnancy, 36.3% of low birth weight cases (calculated as RERI/RR(A+B+) i.e. RERI/ RR for young mothers exposed to pesticides = 1.56/4.05) were attributed to the interaction effect.

Conclusion

Pesticide exposure during pregnancy has adverse effect on LBW outcome. Young age (<=20 yrs) is a strong independent risk factor for low birth weight. The risk is much higher in young mothers who are exposed to pesticide during pregnancy.

70% of low birth weight babies in young mothers exposed to pesticide could be prevented if the mothers age crosses 20 years.

Substantial interaction occurs between young maternal age and pesticide exposure, therefore, all pregnant women should be discouraged to handle pesticides, particular the younger ones (<= 20yrs) during pregnancy</p>



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