Subject information sheet

Project name: Pune Gestational diabetes (GDM) study: Elucidation of the role of maternal nutrient status during pregnancy, with emphasis on selected anti-oxidants, on maternal glucose tolerance and pregnancy outcome

A project focusing on "better health for mother and child"

You are being invited to take part in this research study as part of a PhD program, in diabetes unit KEM hospital, Pune. Your participation in this study is voluntary. Before you decide to participate it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully and discuss it with others if you wish. Once all your questions have been adequately answered you will be asked to sign a consent form.

Diabetes has emerged as one of the most important health concerns of people today. Owing to highly pressurized lifestyles coupled with unhealthy eating habits, there has been an increase in the number of people that suffer from such lifestyle diseases worldwide. Similarly the Burden of chronic disease like diabetes is growing in India as well. One of the many reasons being nutritional transition. In pregnancy, also, diabetes (gestational diabetes) has known to have adverse effects on mother and fetus during pregnancy and their later life. Therefore we are going to examine the relationship between lifestyle factors like food habits physical activity, stress, and body composition and circulating levels of glucose and vitamin C. gestational diabetes and other effects like premature delivery.

The study has been approved by the Ethics committee of KEM hospital research center, Pune.

The invitation is open to women who:

- Are in 3rd trimester of a single-tone pregnancy who are healthy or with diagnosis of gestational diabetes
- Live in Pune city and attend antenatal clinic after 28 weeks of gestation

The objective of the project is:

- To make pregnancy care even better
- To assess life style pattern of pregnant mothers and help/teach them to choose healthy way.

What are the possible benefits of taking part? The said investigations and examinations will be offered free of cost to you. Results of these tests will be disclosed to you, your treating physician and research staff involved in the study. All the study participants will be offered with a report of blood investigations done in the study.

What do I need to do if I decide to participate in the study?

The following information will be acquired from your medical records: (weight, height, blood pressure, Ultra sonographies which are available.)
You will be interviewed by research assistant to get information related to the study, using a questionnaire. (Demography information, medical and obstetrical history, physical activity, diet and general health of mother and her family). Information on your dietary habits will be obtained using 24 hour dietary recall and food frequency questionnaire.

An oral glucose tolerance test will be done to check your blood glucose levels. A total 20 ml venous blood will be drawn at 3 time points: (fasting, 1 hour and 2 hours after a glucose drink. your remaining blood will be stored for further analysis.(with just one time pricking).

If you agree to participate in the study, you have the right to see which information has been registered about you and your family. You also have the right to correct any mistakes in the registered information. If you choose to withdraw from the study, you can demand that the collected test results and information be deleted, unless the information has already been used in the analysis or used in scientific publications.
After completing the visit, you will continue to be treated /visited by your doctor as usual.
All information will remain confidential.

**Is there any risk in participating in this study?**
There is no risk in participating in this study.

**Can I withdraw from the study at any time?**
You are free to withdraw from the study at any time point during the course of the study. If we decide to discontinue your participation in the study, we will discuss it with you. This will not affect the medical care being given to you otherwise.

**Contact for further information:**
For further information about this study please contact: Dr. C. S. Yajnik /Ms. Hedyeh Masoodi, Diabetes Unit, KEM Hospital Pune (020-26111958, 020-66405731)

**Thank you for taking time to read and consider the information in this leaflet.**
Consent form:

I have carefully read the information about “Pune gestational diabetes study” project being conducted by PhD student in diabetes unit KEM hospital research center, Pune. I have discussed and understood the purpose and procedures of this study. This was discussed with me with the language I understood.

I am aware that I will have to undergo medical examination and blood tests.

I am fully aware that I can opt out of the study at any time. I understand that my tests performed in the study will be free.

My identity will be kept confidential and information will be used for research purpose only. Study information will be accessible to principle investigator, study coordinators, research staff, ethics committee members, regulatory authorities, and not to anyone else without my prior permission, even if I opt out of the study.

I am aware that if I have any queries or need more information regarding this study, I may contact any of the persons, on the numbers provided in the attached information sheet.

I agree to take part in this research study, and to cooperate for the various tests without any sort of pressure or monetary gain.

Subjects signature or left hand thumb impression:

Name of the signee
(subject)

In case of thumb impression impartial witness’s
signature

Date:

Name of the signee
(witness)

Study coordinator’s/ investigator’s
signature

Date:

Name of the signee
(investigator)

Husband’s signature

Name/date:
A. DEMOGRAPHIC DATA OF PREGNANT MOTHER:
Q1. Name: (first/middle/last)
Q2. Contacting address: (landmark if any)
Q3. Phone/mobile number:
Q4. Age of pregnant mother in completed year (date of birth):
Q6. Education of pregnant mother:
Q7. Occupation: 1. Non-employed □ 2. Employed □
   Please specify.............
Q8. Family type: 1. Nuclear □ 2. Extended □
Q9. Number of family members: Adults: □ children (<12 yrs) □
   Per capita unit...
Q10. Total income of family (Rs/month): <10000 □ 10000-20000 □ >20000 □
   (........................Rs)
B. OBSTETRIC/MEDICAL HISTORY:
    If yes please specify, by entering the code: (1. Father 2. Mother 3. Siblings 4. Children 5. Other) □
Q12. Current obstetric history: G □ P □ A □ D □
Q13. Length of last birth interval: ...........
Q15. If yes treatment 1. Diet □ 2. OHA □ 3. Insulin □
Q16. Babies: single □ twins □ other (triplets...)
Q17. Events by date (if more than one please mention all by date):
   5. Other (EP...) □
Q21. Status:
1. Alive 2. Early neonatal death (up to 7 days) 3. Late neonatal death (8-28 days)

C. ANTENATAL INFORMATION/ANTHROPOMETRIC MEASUREMENTS:
Height (cm): Pre-pregnancy weight (kg): Weight gain (kg) at the time of interview: weight (kg) at the time of interview:
Weeks of gestation at the time of interview:
Total weight gain during pregnancy: pre-pregnancy BMI:
LMP EDD BP at time of visit:

D. INVESTIGATIONS:

<table>
<thead>
<tr>
<th>Trimester</th>
<th>Date</th>
<th>Wks of gestation</th>
<th>Hemoglobin (g/dl)</th>
<th>RBC count /mm³</th>
<th>Fasting Blood Glucose (mg/dl)</th>
<th>Glucose 1hrs PG (OGTT) mg/dl</th>
<th>Glucose 2hrs PG (OGTT) mg/dl</th>
<th>Vitamin C (µmol/l)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Second</td>
<td></td>
<td>(24-28w)</td>
<td></td>
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</tr>
</tbody>
</table>

E. ANTENATAL ULTRA-SOUND REPORTS:

<table>
<thead>
<tr>
<th>date</th>
<th>Weeks of gestation</th>
<th>HC</th>
<th>FL</th>
<th>BPD</th>
<th>AC</th>
<th>placenta</th>
<th>Amniotic fluid</th>
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</thead>
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</table>

F. PRESENT OBSTETRIC INFORMATION/COMPLICATIONS:

Q22. Fetal macrosomia: Yes 2. No (…… weeks)
Q23. Polyhydramnios: Yes 2. No (…… weeks)
Q24. Pre-term labor: Yes 2. No (…… weeks)
Q25. Maternal anemia (<10.5 g/dl): Yes 2. No (…… weeks)
Q26. IUGR: Yes 2. No (…… weeks)
Q27. oligohydramnios: Yes 2. No (…… weeks)

G. DELIVERY/POST-PARTUM INFORMATION:

Date of delivery: weeks days
If LSCS 1. Emergency 2. Elective
IV Dextrose Insulin infusion
   If 2, 3 cause........................
Q31. Sex of baby: 1. Male ☐ 2. Female ☐
Q32. Mother alive 1. Yes ☐ 2. No ☐ if 2 reason.............
Q33. PROM (premature rupture of membrane) 1. Yes ☐ 2. No ☐

H. NEONATAL COMPLICATIONS:
Q34. Hypoglycemia 1. Yes ☐ 2. No ☐
Q35. Respiratory problem? 1. Yes ☐ 2. No ☐
Q36. Hyperbilirubinemia 1. Yes ☐ 2. No ☐
Q37. Hypocalcaemia 1. Yes ☐ 2. No ☐
Q38. Neonatal mortality 1. Yes ☐ 2. No ☐
Q39. Admission to NICU 1. Yes ☐ 2. No ☐

I. DIETARY HABITS:
   4. Non-vegetarian ☐ 5. Other ☐

Q41. Non-vegetarian:

<table>
<thead>
<tr>
<th>Food item</th>
<th>Y/N</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Rarely/occasionally</th>
<th>Amount</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<tr>
<td>Fish</td>
<td></td>
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<tr>
<td>Mutton</td>
<td></td>
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<tr>
<td>Chicken</td>
<td></td>
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<tr>
<td>Prawn</td>
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<tr>
<td>Beef</td>
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</tr>
</tbody>
</table>

Supplements taking:
Q42. Taking iron tablet in pregnancy? 1. Yes ☐ 2. No ☐
   if yes since when------- Number of tablets/day............. Frequency daily (OD)/BD/other...........

Q43. Taking calcium tablets during pregnancy? 1. Yes ☐ 2. No ☐
   if yes since when-------
   Number of tablets/day............. Frequency daily (OD)/BD/other...........

Q44. Are you taking any vitamin? 1. Yes ☐ 2. No ☐
   If yes since when-------
   Number of Tablets/day............. Frequency daily (OD)/BD/other.............
Q45. Are you taking nutritional supplements? 1. Yes  2. No
name........company....
If yes since when-------- Number of tablets/day..............
Frequency daily(OD)/BD/other..........

**Q46. Types of oil used for cooking:** (to find out EFA and vitamin E status)

9. Other (butter, pure ghee, vanaspati (dalda), corn oil, rice bran oil, olive oil, cotton seed oil)

If using mixed oil, please specify which oils and in what proportion..................

**Quantity required per month:**

Oil--------kg   ground nuts(shengdane)--------kg    sesame--------kg
dry coconut(suke khobare)--------kg
Fresh coconut(ole khobare)--------number/month
Sugar--------kg   jaggery(goola)--------kg

**Vitamin A:**

Q47. How many times per day do you take yellow fruits (like citrus fruit, mango)?

1.1 time  2. 2-3 times  3. >3 times  4. Other

Q48. How many times per day do you take yellow /green leafy vegetables(bhaji)(like pumpkin(bhupale), carrot(gajar), spinach)?

1.1 time  2. 2-3 times  3. >3 times  4. Other

Please specify the portion size-----------------------------------
**Q49. Dietary habits which may influence on formation of more free radical in the body:**

<table>
<thead>
<tr>
<th>item</th>
<th>Y/N</th>
<th>daily</th>
<th>weekly</th>
<th>monthly</th>
<th>Rarely</th>
<th>Amount/type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Fast foods/ready to eat foods (pizza, magi, pasta, pav bhaji, sizzlers, Chinese foods idli, vadapav)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>2. Eating outside</td>
<td></td>
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<tr>
<td>3. Sweet snacks (chocolate, ladoo, halwa, sweetened fruit juices, cola beverages, jam, jellies, other soft drinks)</td>
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<tr>
<td>4. Fried/salty snacks (farsan, roasted papad, bundhi, chivda wafers, samosa, cutlet, puries chips, burger)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Bakery products (toast, biscuit cream roll, dough nuts, khari, butter cake)</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

**Q50. Do you have morning sickness now?**
- Yes [ ]
- No [ ]

**J. SMOKING HABITS:**

**Q51. Do any of family members at home smoke in your presence (at least once per day)?**
- Yes [ ]
- No [ ]

**Q52. Do you smoke?**
- Yes [ ]
- No [ ]

**Q53. Do you chew any kind of tobacco?**
- Yes [ ]
- No [ ]
**K. Q54. LIFE STRESS:**

During the past one year have you had any of the following things happen to you? If so, simply circle only one number following those items which has occurred in your life recently (and only those items that apply to you).

<table>
<thead>
<tr>
<th>Numbers</th>
<th>Life event</th>
<th>Slight1</th>
<th>Moderate2</th>
<th>Great3</th>
<th>Not applicable4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Change in social activities</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>2.</td>
<td>Change in sleeping habits</td>
<td>10</td>
<td>15</td>
<td>20</td>
<td>1</td>
</tr>
<tr>
<td>3.</td>
<td>Change in residence</td>
<td>10</td>
<td>20</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>4.</td>
<td>Change in work hours</td>
<td>15</td>
<td>20</td>
<td>25</td>
<td>1</td>
</tr>
<tr>
<td>5.</td>
<td>Tension at work</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>6.</td>
<td>Small children in the home</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>7.</td>
<td>Change in living conditions</td>
<td>20</td>
<td>25</td>
<td>30</td>
<td>1</td>
</tr>
<tr>
<td>8.</td>
<td>Outstanding personal achievements</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>9.</td>
<td>Problem teenagers in the home</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>10.</td>
<td>Trouble with in laws</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>11.</td>
<td>Change in responsibilities at work</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>12.</td>
<td>Taking over a major financial responsibility</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>13.</td>
<td>Foreclosure of mortgage of loan</td>
<td>25</td>
<td>30</td>
<td>35</td>
<td>1</td>
</tr>
<tr>
<td>14.</td>
<td>Change in relationship with spouse</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>15.</td>
<td>Loss of a close friend</td>
<td>30</td>
<td>35</td>
<td>40</td>
<td>1</td>
</tr>
<tr>
<td>16.</td>
<td>Gain of a new family member</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>1</td>
</tr>
<tr>
<td>17.</td>
<td>Sex difficulties</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>1</td>
</tr>
<tr>
<td>18.</td>
<td>Pregnancy</td>
<td>35</td>
<td>40</td>
<td>45</td>
<td>1</td>
</tr>
<tr>
<td>19.</td>
<td>Change in health of a family member</td>
<td>40</td>
<td>45</td>
<td>50</td>
<td>1</td>
</tr>
<tr>
<td>20.</td>
<td>Personal injury or illness</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>1</td>
</tr>
<tr>
<td>21.</td>
<td>Loss of self-confidence</td>
<td>45</td>
<td>50</td>
<td>55</td>
<td>1</td>
</tr>
<tr>
<td>22.</td>
<td>Death of a close family member</td>
<td>50</td>
<td>60</td>
<td>70</td>
<td>1</td>
</tr>
<tr>
<td>23.</td>
<td>Marital separation</td>
<td>55</td>
<td>65</td>
<td>75</td>
<td>1</td>
</tr>
<tr>
<td>24.</td>
<td>Divorce</td>
<td>65</td>
<td>76</td>
<td>85</td>
<td>1</td>
</tr>
<tr>
<td>25.</td>
<td>Death of spouse</td>
<td>80</td>
<td>100</td>
<td>120</td>
<td>1</td>
</tr>
</tbody>
</table>
L. PHYSICAL ACTIVITY QUESTIONNAIRE (before pregnancy): (IPAQ)

Q55. Remember pre-pregnancy duration, or seven days before you come to know about your pregnancy,

1A. in a week, how many days did you do vigorous physical activities like heavy lifting, digging, aerobics or fast bicycling? Think about only those physical activities that you did for at least 10 minutes at a time. ........days per week

1B. How much time in total did you usually spend on one of those days doing vigorous physical activity? ..........hours ..........minutes

Or none

2A. again think only about those physical activities that you did for at least 10 minutes at a time. In a week, on how many days did you do moderate physical activities like carrying light loads, bicycling at a regular pace? Do not include walking.......days per week

2B. How much time in total did you usually spend on one of those days doing moderate physical activity? ..........hours ..........minutes

Or none

3A. during a week on how many days did you walk for at least 10 minutes at a time? This includes walking at work and at home, walking to travel place to place, and any other walking that you did solely for recreation, sport, exercise or leisure........days per week

3B. How much time in total did you usually spend walking on one of those days?

..........hours ..........minutes

Or none

4. During a week, how much time did you usually spend sitting on a week day, while at work, at home, while doing course work and during leisure time. This includes time spent sitting at a desk, visiting friends, reading, travelling on a bus, or sitting or lying down to watch television.

..........hours ..........minutes
### SEMI-QUANTITATIVE FOOD FREQUENCY QUESTIONNAIRE

**Vitamin C rich foods**


How often do you yourself consume the following food items?

<table>
<thead>
<tr>
<th>No</th>
<th>Food Item</th>
<th>Daily</th>
<th>Weekly</th>
<th>Monthly</th>
<th>Occasionally</th>
<th>Yearly</th>
<th>Never</th>
<th>Frequency amount</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>FRIUTS:</strong></td>
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<td></td>
<td>goose bury/Amla/anvila</td>
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<tr>
<td></td>
<td>Guava/peru (white flesh)</td>
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<td>Orange</td>
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<td>Lime/musambbe</td>
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<td></td>
<td>Papaya (ripe)</td>
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<td>Lemon/limbus</td>
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<tr>
<td></td>
<td>Pineapple/pineapple juice/ananas</td>
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<td></td>
<td>Custard apple/Seetaphal</td>
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<td>strawberry</td>
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<td>Mango (ripe)/amba</td>
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<td>pomegranate</td>
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<td></td>
<td><strong>VEGETABLES:</strong></td>
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<tr>
<td></td>
<td>Capsicum/dhobali mirchi</td>
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<td></td>
<td>Coriander leaves/kothimber</td>
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<td>Cabbage/kobi</td>
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<td></td>
<td>Bitter guard/karela</td>
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<tr>
<td></td>
<td>Cauliflower/phool gobee</td>
<td></td>
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<tr>
<td></td>
<td>Fenugreek leaves/Methi</td>
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<tr>
<td></td>
<td>Tomato (ripe)</td>
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<td></td>
<td>Spinach/palak</td>
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<tr>
<td></td>
<td>Potato/batata</td>
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<tr>
<td></td>
<td>Green chilli</td>
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<td>Tamarind pulp</td>
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<td>Drum steak leaves</td>
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<td></td>
<td>Turnip</td>
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</tr>
<tr>
<td></td>
<td>Carrot/gajar</td>
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</tr>
<tr>
<td></td>
<td>Amaranth/Raigira bunches</td>
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<tr>
<td></td>
<td>Sprouted Bengal gram/matki</td>
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225
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<tr>
<th>No</th>
<th>Food Item</th>
<th>Daily</th>
<th>Weekly 5</th>
<th>Monthly 3</th>
<th>Occasionally Yearly</th>
<th>Never 1</th>
<th>Frequency amount</th>
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<td>Clove (lavang)</td>
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<tr>
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<td>Cumin seeds/zeera</td>
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<tr>
<td></td>
<td>Curry powder/kadipatta</td>
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<tr>
<td></td>
<td>Ginger/aalah</td>
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<td>Nutmeg/jaiphal</td>
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<tr>
<td></td>
<td>Pepper black/kalimiri, mirpud</td>
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<tr>
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<td>Turmeric/haldi</td>
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<tr>
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<td>Cinnamon/dalchini</td>
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<tr>
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<td><strong>FRUITS</strong></td>
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</tr>
<tr>
<td></td>
<td>Apple, raw</td>
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<tr>
<td></td>
<td>Date/khajur</td>
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<td>Fig/anjir</td>
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<td></td>
<td>Orange</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>Berries like strawberry/bore</td>
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<tr>
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<td>Pomegranate</td>
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<td><strong>VEGETABLES:</strong></td>
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</tr>
<tr>
<td></td>
<td>Coriander leaves/kothimber</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Garlic raw/lason</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Onion (red, raw)</td>
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<td></td>
<td>Spinach/palak</td>
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<td></td>
<td>Almonds/badam</td>
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</tr>
<tr>
<td></td>
<td>Cashew nuts/kaju</td>
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</tr>
<tr>
<td></td>
<td><strong>BEANS (PULSES and LEGUMES)</strong></td>
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</tr>
<tr>
<td></td>
<td>Black beans/kala chana, kale vali</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Kidney beans/Rajma</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Cow peas, black eyes/white vatana</td>
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<tr>
<td></td>
<td>Lentil/masoor</td>
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<tr>
<td></td>
<td><strong>MISCELLANEOUS</strong></td>
<td></td>
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<tr>
<td></td>
<td>Dark/milk chocolate</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Pop corn air-popped</td>
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</tbody>
</table>
### 24 HOUR RECALL (week day)

**DATE:** ______/_____/_____

<table>
<thead>
<tr>
<th>Time</th>
<th>Food Item</th>
<th>Serving</th>
<th>Serving Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early morning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakfast</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mid day</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Afternoon snack</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dinner</td>
<td></td>
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<tr>
<td>Bed time</td>
<td></td>
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</tr>
</tbody>
</table>

### 24 HOUR RECALL (weekend day)

**DATE:** ______/_____/_____

<table>
<thead>
<tr>
<th>Time</th>
<th>Food Item</th>
<th>Serving</th>
<th>Serving Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Early morning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakfast</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Mid day</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Lunch</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Afternoon snack</td>
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<td></td>
</tr>
<tr>
<td>Dinner</td>
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<td></td>
</tr>
<tr>
<td>Bed time</td>
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</tbody>
</table>
माहिती पत्र

माहिती गर्भवत्तातीत पोषणमूल्यांचा निर्णय (विवेकपत्र: काही निवडक जीवनसांगाचा)
माहिती गर्भवत्तातीत (सहानुभूती) सालाचे प्रमाणांक व मृत्युप्रमाणे होणारे परिणाम
अध्ययने,

अभ्यासाचे शिर्षक:

गर्भवत्तातीत मधुमेह अभ्यास : गर्भवत्तातीतील उद्ध मधुमेहीयऱे आई
वाढत्या आशोवायर होणारा परिणाम अध्ययने.

या अध्ययनाची मुख्य उद्देश्य आई व वाढत्या जोडते आशोवायर हा आहे:
के. ई. एम. हॉपिटल, मधुमेह विषयाचे प्रश्न एवढे पी.ई.डी. सांथी होणाचा अध्ययन सहायगी
होणारा आज्ञा नियंत्रित करणार देत आहे. आपण आपण या अध्ययनातील सहभाग
पुर्णात: स्वाभाविक आहे. आपण या अध्ययनातील सहभागी होणारा आपल्याचा हे माहिती
असां मार्गवेच आहे की त्या म्हणून हा अध्ययन करणे आहे व त्यामध्ये काय करणे आहे. आपण
वर्ष प्रमाणांची सांगणारंजकाच उद्देशी दिनांकनात अध्ययनाचा एक संबंधी पद्धतीवर होणारे
करण्यास सांगणारंजक म्हणून प्रस्तावना देणार. आपण माहितीशी वाढत्या जोडते व म्हणून त्याचा
वाढत्या प्रयत्न वाढवणारे सांगणारंजक पद्धती उपयोगाचे इतने प्रसिद्ध करत.

आपण अभ्यास मधुमेह हा आशोवायर महाला घटक ज्ञात आहे. रोजची
धक्काकीमा जीवनालग बुधत जाणार्या ज्ञानाबोधीला निर्माणाचा मधुमेह अनुप्रयोगाचा
नोंदवणाऱ्यांत बाळ प्रायें आहे. तत्त्व भारतामध्ये राहू या प्रमाण म्हणून आहे ज्ञानाबोधीला
करणार हे आहे. गर्भवत्तातीत मधुमेहीयऱे आशोवायर व आईवर त्याचे प्रमाण होतात. तसेच
पुढील अनुप्रयोगातील ज्ञान प्रमाण हिंदू शास्त्र. यासाठी आणां मधुमेह व रोजची देखील
आपण या गोष्टियांचा आपल्याचा करणे आहे. नासे ज्ञानाबोधीला सहभागी, तांत्रिक,
वेच व शरीरसांगाचे प्रमाण, तसेच त्याचे प्रमाण हे घटक अभ्यासाचे आहे. गर्भवत्तातीतील मधुमेह व इतर प्रमाण (या से डॉक्टरचे बात ज्ञात आहे)
या अध्ययनाचे के. ई. एम. हॉपिटल (संस्थेचे केंद्रीय नित्यपत्र संस्थीतील)
प्रसिद्ध करते. आहे.

(1)
या अभ्यासात धोक गृहल महिला सहभागी होऊ शकतात.

★ नुक्त्यां गोदर आहेत तर नेहम्मत ह्यांसारे आहें, ज्या निरोगी आहेत व ज्यांना
गोदरपणातील मधुमेह नेहम्मत प्रकार आहे तरी महिला
★ ज्या पुष्पांच्या सहभागी व के. इ. ए. हॉस्पिटल वेळे २४ ते २८ आणणांथ्या
अभ्यास घेत देऊ शकतात.

या अभ्यासाचे उद्देश्य आहे:

★ प्रसूतीपूर्ण काहिकल धोकादायक भाव (ज्या म्हणजेच व्यायामकर्त्या वेळे, प्रसूती काहिकल वाईट इत्यादी)
धोका अनियमित दक्षिणात, गोदरपणातील मधुमेह, गोदरपणातील मधुमेह निकाळ म्हणून
होणारा घोष (अंगूठ दिसल्यासारख्या)
★ अभ्यास करणे.

★ गोदरपणात विशेष वार घोष 'आला रोजन वाढ, ज्यात भंडी
नुक्त्यांच्या सेवन कमी ध्यानातील असणारे सेवन, कमी सार्व्याल मधुमेह अनेक
गोदरपण) महिला अनियमित दक्षिणात, गोदरपणातील मधुमेह, गोदरपणातील
मधुमेह निकाळ म्हणून होणारा घोष (अंगूठ दिसल्यासारख्या)

या अभ्यासाला सहभागी म्हणून लागणारे काळ काढत देऊ शकतात.

या अभ्यासानुसार करून येणार्या सवं दक्षिणात मोठा करून येतें.

या चार्टप्रकारे निर्णय सुप्रीम व सुप्रीम पुसळा व उच्च पुसळा उच्चार करणारी सार्व्याल तेली. सवं सहभागीतून ह्यांना हे
चार्टप्रकारे निर्णयांचा प्रत देवियाच्या हेडल. (सह नयना ह्यांची अभ्यास तुळ्यावर देविया हेडल)

मी या अभ्यासात सहभागी होणाऱ्या ठिकाणी तर म्हणून काय करू शकतात लागणारे?

तुळ्यावर पुढील दक्षिणात करून लागणारे.

ज्येंचा, ज्येंचा जादू, धात, धात, व मंगळचा घेर यांचे मोठा करून पेडल तर्फे
सहभागी मोठा करून पेडल तसे ११ दिवसांमध्ये मुख्यांच्या हेडल.

तरी (ते २ व त्यांच्या

चार्टप्रकारे निर्णयांचा प्रत देवियाच्या हेडल म्हणून थांब येणार ह्यांची ह्यांच्या करून अन्य सूचीबद्ध करून ध्यानांच्या हेडल.

या अभ्यासानुसार काही माहीतीसाठी अनेक तुळ्यावर विवरणात देतील.
(या जबल्के तुळ्यावर आणणांतराचे ध्येय किंवा मोठा करून पेडल सूचीबद्ध करून अन्य सूचीबद्ध करून ध्येयांची हेडल)

(२)
या अथायातरम्यान व अथायाशी संयंचित सर्व चावय्या गोकर केल्ला जतीत. अथायातरम्यानम आपल्या आपल्याशी निगरीत जर काही चावय्या आपल्या आपल्यांशी काहीत कात्यायन सांगितत्वा तर त्या खर्च तुप्पाळा करणा लागेल. या अथायातून सहभागी होण्यासारे तुप्पाळा काही मोक्यास दिला जाणार नाही.

तुम्ही जर या अथायात सहभागी होण्यासे उद्दिले तर तुप्पाळा हे वर्णणाच्या अधिकार आहे की तुन्हा या तुप्पाळा कृत्यसाधनाच्या काय माहिती बेळती आहे. जर त्यांच्या काही सुका आदतल्यास त्या वेशर कर्यक्रमाच्या अधिकार तुप्पाळा आहे. जर आपण या अथायातून बहुसय प्राप्तचे उद्दीप्ते तर तुम्ही त्याच्याशी आहवाल काहीत टाकणाऱ्या सांगत शक्ता. जर ते या आपल्या शोध निर्वातील संस्थेच्या निर्णय कार्यक्रमातील वापरले नसतील तर आपल्या त्या नृपशास्त्री काही त्या शिष्यांक राहू शकतो. जर आपण परागाची दिळी तर हे रंग (साक्षात) पुढील काही अथायातांशी आपल्याच देखील दक्षारे तर ते सहभागी त्या नस करण्यात येईल. त्या तुप्पाळा अथायाताच्या सहभागावर काहीही परीच्याच होणार नाही. सहभागा नृपशास्त्र तुम्ही नाही पाठ्याक्रम देणार नाही. त्यानांना एक आफ्रेक क्रमांकांतर आफ्रेकले जाईल.

जर आपल्या आपल्यात काही बदल झाले आणि आपल्या हॅंडलांशी या अथायातून आपल्या सहभागातून प्रेषणास सांगितते तर आपल्याला या अथायातून बाहेर पाठ्याक्रम सांगती देण्यात येईल.

या अथायात सहभागी हेतापर आपल्यास्त इतर कुट्याच्या अथायात सहभागी होऊ शक्यास नाही. हेतापर हॅंडली भेट हास्यांत तुप्पाळा तुप्पाळ नेहमीचा भौतिकांत निर्मित सांगती करता येईल. सर्व माहिती हे तेसरात येईल.

(३)
या अभ्यासात सहभागी होणारा काहीं जोख़ीम आहे का?
या अभ्यासात सहभागी होणारा काहीं जोख़ीम नाही. फक तर नमुना शेतकरी आपल्याला सूर्य दोषपाचक कुळांत. तर नमुना शेतकरी तो प्रशिक्षित व्यक्तिकूल, काळजीपुर्ण मधुमेह विभाग के.ई. एम. हॉस्पिटल, पुणे येथे शोधायला वेळ.

मी या अभ्यासातून काहींतीव्र पर्याय पळू शकते का?
या अभ्यासातील सहभाग व्यूहाने प्रशिक्षक आहे. सुरुहाला या अभ्यासातून पर्याय पर्यायांचे पूर्ण स्वातंत्र्य आहे. जर आहेही पहेलीही या अभ्यासातून काळ्रे तर व्यावहारिक आहेही आपल्यासारी वर्ण करू. त्यासाठी सुरुहाला काहीं तर प्रमाणित वाचू लगणार नाही.

अधिक माहितीसाठी संपर्क साधारण
ડॅ. श्री. प. वालिक / हेड इंस्ट्रक्टर
मधुमेह विभाग के.ई. एम. हॉस्पिटल, पुणे
फोन : 020-26919198, 020-66409439

आपण हे माहितीप्रद कावण्या व समजण्यासाठी वेळ दिल्यावर आहेही आपले आंखांनी आहोत.
संस्कृत पत्रक

मे नाथहरियन्त्रकरं दिल्ली नाथवीर पुष्पवालिल मन्धातासीर र अन्यात गंगावर्तिताल मन्धातासीर उप
मन्धातासीर चढ़े ई र शास्त्री आयोगार सन्त र परिणाम अन्यात या विद्याय तव माहिती
शर्माली आहे, हा अन्यात पूर्व, श्री. अभ्यास कर्मार्थी विद्यार्थिनी के. ई. एस. हॉस्पिटल सिंथेटिक सेंटर
रेल कर्णार आहे. मला या अभ्यासविद्यारी तव माहिती व पद्धत समाप्ती आहे, मला समजूल अशा
भाषेलो मला ही माहिती देखणार आली आहे.

मला हे माहित आहे की मला काही खपसणा व रक तपासणी करारी लागेल.

मला हे माहित आहे की मी या अभ्यासातून कर्मी बाहेर पडूं शकते. मला हे माहित आहे
की या अभ्यासादरम्यान केल्या ज्ञानाचा तपासणी मोक्षात आहेल.

माजी भोक्त गुप अभ्यासत वेंडळ व माहिती फक्त संख्यानासाठी वापरली जाईल, या अभ्यासातून
संचालित झालेली माहिती, मी जरी या अभ्यासातून बाहेर पडले तरी संख्याक.
हा संख्याक, अभ्यासक व इरादे संख्यान कर्मारी, निर्देशना समती, नियमक मंडळ यांना
याच्याची पत्तानांनी आहे.

मला हे माहित आहे की जर मला या अभ्यासविद्यारी शंका असलेल्या तर माहितीप्रकरण
दिलेल्या कोणाचं ही संघर्ष साधून माइया शंकेके निरसन कर शकते.

मी अभ्यासात सहायक होणारी मन्दता मान्यता देत आहे. तलेय या अभ्यासादरम्यान केल्या
ज्ञानाचा वाचणासाठी मी तहाकार करून. त्यावद मला कोणत्याही मोडद्वारी अवेशा नाही.
To whomsoever it may concern

This is to certify that Ms. Hedeyh Masoodi, PhD student from Health Science department, working under the guidance of Dr. Yajnik, has performed plasma vitamin C analysis of her samples in Department of Zoology, under the supervision of Dr. Saroj Ghaskadbi.

Prof. B.B. Nath,
Head,
Department of Zoology
HEAD
Department of Zoology

Department of Zoology, University of Pune, Pune-411 007 (India)
Telephone: 020-25601436, 25601437; Telex: 25690617
Figure 8.1.1. The gestational age score: the weight, height and head circumference can be plotted on the infant's growth chart. This information is how the infant is diagnosed as SGA, LGA, or AGA.
8.1.2. Intra uterine weight for gestation chart
Figure 8.1.3. Neonatal Gestational Age, physical Maturity (Ballard chart)

Figure 8.1.4. Neonatal Gestational Age, neuromuscular Assessment (Ballard score)
University of Pune

Rules Governing the Presentation of Thesis for the Degree of

Doctor of Philosophy (Ph.D.)

1. Submission:
   A candidate shall submit to the Registrar four copies of his thesis. If the degree is awarded, the first copy of the thesis shall be kept in the University Library, the second in the appropriate Department or Institute, the third shall be returned by the University to the candidate’s supervisor.

2. Binding:
   The copies of the thesis shall be bound in cloth-covered boards with leaves permanently secured.
   
   The front cover shall bear the title of the thesis, the name of the author, the name of the degree for which the thesis is submitted and the year of submission.
   
   The spine of the thesis shall bear the name of the author, the degree for which the thesis is submitted, the name of the supervising Department or Institute and the year of submission. Optionally, it may also bear the title of the thesis. The information shall be printed along the spine in such a way that it is readable when the volume is lying flat with the front cover uppermost.
   
   If the thesis consists of more than one volume, the front cover and spine shall also bear the number of each volume.

3. Paper and Type:
   All copies of the thesis shall be presented in a permanent and legible form in typescript or print. Copies produced by xerography or comparatively permanent processes will be acceptable. Drawings and diagrams should be in black ink.
   
   Paper of good quality and sufficient capacity for normal reading should be used.
   
   The size of the sheets used should normally be A4 (i.e. 21 cm. x 29.7 cm. approx.).
   
   Margins at the binding edge shall be not less than 4 cm. and other margins not less than 2 cm.
   
   Double or one-and-a-half spacing be used in typescript, except for industry quotations or footnotes where single spacing may be used.

4. The Title Page and The Text etc.:
   (a) The title page of the thesis shall give the following information in the order listed:
      (i) the full title of the thesis and the subtitle, if any;
      (ii) the total number of volumes if more than one and the number of the particular volume;
      (iii) the full name of the author;
      (iv) the degree for which the thesis is submitted;
      (v) the name of the University;
      (vi) the name of the department, institute or centre in which the research was conducted;
      (vii) the month and year of submission.
   (b) A table of contents shall immediately follow the title pages.
   (c) If a list of tables and illustrations is provided, it should follow the table of contents and should list all tables, photographs, diagrams, etc. in the order in which they occur in the text.
   (d) Any acknowledgements shall be on the page following the table of contents.
   (e) If the thesis contains any material which the author has used before, this fact shall be indicated in a declaration immediately following the acknowledgements.
(f) There shall be abstract of the thesis. The abstract shall follow the acknowledgements and declaration.

(g) For abbreviations not in common use a key shall be provided with the full term followed by the abbreviation in brackets.

(h) The thesis shall be divided approximately into chapters, sections, and subsections. The system of headings should be consistent and should provide a clear indication of changes in content, emphasis and other features which occur at each stage of the work.

References cited in the text may be identified by one of the two methods, either—

(i) by numbers typed as superscript, or if on the line, in round brackets, immediately following the relevant word or phrase in the text. or

(ii) by citing the author's name, date of publication and the page number(s) in round brackets immediately following the relevant word or phrase in the text (e.g. Cgomsy, 1982 : 22-25).

(i) Appendices shall follow the main text. The style of the appendices shall be consistent with the style of the main text.

(j) The list of references should be arranged in accordance with the system of citation used. When using the method given in (h i) the references should be listed in the order in which they are identified in the thesis. When using the method given in (h ii) they should be listed alphabetically by the author's surname.

In both cases the list should enable the reader to identify the work cited and to locate the specific pages referred to.

(k) If bibliography is supplied it should be arranged in a logical order, for example in broad subject classes and within each class, alphabetically by author.

5. Illustrative Material :

(a) Wherever practical, diagrams, maps, illustrations, computer printout published papers and tables shall have a binding margin of at least 4 cm. and should, if possible, be bound in the thesis nearer the appropriate text.

(b) Material which cannot be conveniently bound in text (such as large maps, slides, sound or videotapes, cine films) shall be packaged in such a way that it can be bound with the thesis. If the amount of such material is substantial, it should be gathered into a supplementary volume and packaged in a rigid container similar in format to the bound thesis. Unbound material and its packaging shall both be marked with the author's name, initials and the degree for which the work is submitted in such a way that it can be readily linked with the thesis and it shall contain appropriate instructions for use.
Appendix 2:
8.2.1. Antioxidant defense system: (This and next page is all from srilaxmi, 2007)

“Major antioxidant mechanisms involved in fighting free radical damage are:

- Interaction of ascorbic acid and glutathione (GSH) with oxidants and oxidizing agents.
- Scavenging of free radicals and singlet oxygen by vitamin E, ascorbic acid, β-carotene and super oxide dismutase (SOD).
- Reduction of hydroperoxidase by glutathione peroxidase (GSHPx) and catalase enzymes
- Binding of transition metal by various chelators and repair of cellular damage by various metabolic activities.

Combating free radicals and reactive oxygen species: Potentially injurious effects of free radicals and reactive oxygen species are prevented by a well organized antioxidant defense system.

- The first line of defense is prevention. The multistep reduction of oxygen to water in the mitochondria is carried out by cytochrome, and other metalloenzymes held together so that the intermediates like superoxide are not released into the cell. Similarly ions of the transition metals like iron and copper which can trigger reactive oxygen species formation are bound or sequestered by proteins like transferring and ceruloplasmin, to keep them out.
- The second line of defense is provided by the antioxidant enzymes present in all cells. They speedily attack the reactive oxygen species and inactivate them. Superoxide dismutase reacts with superoxide to give less toxic hydrogen peroxide.

\[ 2O_2^- + 2H^+ \rightarrow H_2O_2 \]

Hydrogen peroxide is inactivated by two distinct enzymes. Catalase acts on the molecule and splits it to water and oxygen.

\[ 2H_2O_2 \rightarrow H_2O + O_2 \]

A second enzyme glutathione peroxidase-GPx- detoxifies hydrogen peroxide, using a donor of antioxidants known as glutathione (GSH). GSH can exist in two inter-convertible forms:

\[ 2GSH \leftrightarrow GSSG \]

It can give hydrogen to combat oxidant stress. It can also take up hydrogen and can be considered as a storage form of antioxidant. While combating free radicals and reactive oxygen species, glutathione gets inactivated to the oxidized form but can be regenerated by the cellular metabolism using another enzyme glutathione reductase.

\[ \text{GSSG} + \text{hydrogen donor} \rightarrow 2\text{GSH} \]

The hydrogen donor is a nucleotide carrying the vitamin niacin. The enzyme GPx contains selenium. Dietary deficiencies of selenium and niacin also lead to antioxidant
deficiency. The enzyme superoxide dismutase contains copper, zinc, and manganese. Dietary deficiencies of these minerals also lead to antioxidant insufficiency. Riboflavin is needed for maintaining the niacin containing nucleotide participating step in GSH regeneration making riboflavin anti oxidant vitamin.

The third line of defense is the damage control provided by the free radical scavengers. They react rapidly with the free radicals, inactivate them and arrest the chain propagation. In the process they are inactivated into less toxic radicals. The scavenger active on the cell membrane is vitamin E.

![Diagram of vitamin E and vitamin C scavenging]

The inactive form of tocopherol on the cell membrane is regenerated on the cytoplasmic side with vitamin C as the hydrogen donor or free radical scavenger, rendering the vitamin oxidized and inactive. This in turn is reduced and regenerated by glutathione. The resultant oxidized glutathione is reduced to provide a continuous supply of GSH by a cellular enzyme glutathione reductase, which in turn needs the coenzymes of the vitamin niacin, NAD and NADP. These cofactors are provided by glucose metabolism with the help of coenzymes of riboflavin and these vitamins also share the work of free radical scavenging.

The final defense is by repair of the damage molecules and structures by accelerated removal of damaged molecules. For example, LPO products on the membrane are removed by specific phosphor-lipases which cleave the damaged fatty acyl chain which is followed by replacement with fresh fatty acid.

Damaged proteins are digested by proteases and damaged part of DNA are cleaved and repaired. The repaired mechanism is limited and is not exhaustive leading to diseases and disorders.”
8.2.2. TYPE 2 DIABETES MELLITUS ALGORITHM: (Mahan, KL, et.al, 2008)
(Figure 8.2.1)

CAUSES

TYPE 2 DIABETES MELLITUS (insulin resistance;

PATHOPHYSIOLOGY

SYMPTOMS (variable)
Hyperglycemia
Excessive thirst
frequent urination
Polyphagia
Weight Loss

1. Abnormal pattern of
   insulin secretion and action
2. Decreased cellular uptake
   of glucose and increased
   postprandial glucose
3. Increased release of
   glucose by liver
   (gluconeogenesis) in early
   morning hours

MEDICAL MANAGEMENT

NUTRITIONAL MANAGEMENT

EXERCISE

DIAGNOSIS FBG>126 mg/dl
Nonfasting glucose>200 mg/dl
(with symptoms) Oral GTT>200
mg/dl

Lifestyle strategies
(food-eating and physical
activity) that improve
glycemia, dyslipidemia,
and blood pressure

Nutrition
education
(carbohydrate
counting and fat
modification

MONITORING
Blood glucose
A1C testing

MEDICATION Sulfonylurea’s Non-
sulfonylurea secretagogues
Biguanides a-glucosidase inhibitors
Thiazolidinediones

Energy restriction to
promote 5%-10%
weight loss

Blood glucose
monitoring to
determine
adjustments in food
or medications
### 8.2.3. Impact of nutritional deficiency on pregnancy

*(Principle of Nutrition, Srilaxmi, 2007):*

**Table 8.2.1**

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Impact of deficiency on the mother</th>
<th>Impact of deficiency on the infant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy and protein</td>
<td>Abortion</td>
<td>Premature infant</td>
</tr>
<tr>
<td></td>
<td>Complications during delivery</td>
<td>Low birth weight infant</td>
</tr>
<tr>
<td></td>
<td>Ketosis</td>
<td>Less brain cells</td>
</tr>
<tr>
<td></td>
<td>May not gain enough weight to have normal lactation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>PIH</td>
<td></td>
</tr>
<tr>
<td>Linoleic acid</td>
<td>-</td>
<td>Retarded fetal growth</td>
</tr>
<tr>
<td>Calcium</td>
<td>Muscular cramps</td>
<td>calcification of bones and teeth decreased</td>
</tr>
<tr>
<td></td>
<td>Repeated pregnancy with poor diet can result in osteomalacia</td>
<td>Underweight due to the decreased fetal bone growth</td>
</tr>
<tr>
<td></td>
<td>During lactation breast milk may be deficient in calcium</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>Hypochromic microcytic anemia, complications during delivery</td>
<td>Bone with less stores of iron and susceptible for anemia</td>
</tr>
<tr>
<td>Iodine</td>
<td>Goiter</td>
<td>Chance of getting goiter and cretinism</td>
</tr>
<tr>
<td></td>
<td>Increased risk of miscarriage and still birth</td>
<td></td>
</tr>
<tr>
<td>Zinc</td>
<td>fetal mortality</td>
<td>reduced intra-uterine growth rate</td>
</tr>
<tr>
<td></td>
<td>fetal malformations including CNS and teratogenicity</td>
<td>low birth weight preterm baby</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>PIH</td>
<td>increased levels in fetus so more susceptible for vitamin A deficiency</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>Decreased calcium absorption</td>
<td>Calcium metabolism of fetus is affected</td>
</tr>
<tr>
<td>Vitamin K</td>
<td>Decreased prothrombin synthesis</td>
<td>Increased risk of neonatal hemorrhage</td>
</tr>
<tr>
<td></td>
<td>Increased loss of blood during delivery</td>
<td></td>
</tr>
<tr>
<td>Thiamine, riboflavin, and niacin</td>
<td>Deficiency symptoms</td>
<td></td>
</tr>
<tr>
<td>Folic acid</td>
<td>Megaloblastic anemia</td>
<td>Fetal malformation</td>
</tr>
<tr>
<td></td>
<td>Abruptio placenta</td>
<td>Neonatal tube defects, spina bifida, congenital abnormalities like hare lip, cleft palate, hydrocephalus</td>
</tr>
<tr>
<td></td>
<td>PIH</td>
<td>Low birth weight</td>
</tr>
<tr>
<td>Vitamin B 12</td>
<td>Pernicious anemia</td>
<td>Premature baby</td>
</tr>
<tr>
<td><strong>Vitamin C</strong></td>
<td>Premature rapture of fetal membranes</td>
<td>Increased neonatal death rates</td>
</tr>
</tbody>
</table>
8.2.4. **Relationship between maternal and fetal nutrition:** (Dietetics, shrilaxmi, 2007) (Figure 8.2.2.)

- Inadequate food intake and poor nutrient utilization
  - Reduced blood volume expansion
  - Inadequate increase in cardiac output
  - Decreased blood and nutrient supply to the fetus
    - Reduced placental size
    - Reduced nutrient transfer
    - Fetal growth retardation

**Share of nutrients:**
- Nutrients given to the fetus at the expense of mother: folacin, iron, vitamin C and B12
- Nutrients for which mother and fetus compete: B1, B2, B6, and D
- Nutrients for which mother has priority over fetus: I and vitamin A
- Nutrients not stored in the fetus: vitamin C, D and calcium
### 8.2.5. Congenital malformations in infants of diabetic mothers
(Hod M. et al., 2008, pg 175)  (Table 8.2.2.)

<table>
<thead>
<tr>
<th>Organ system</th>
<th>Common Malformations</th>
<th>Rare, Occasional Malformations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiac</td>
<td>Corrected transposition</td>
<td>Tetralogy of fallot</td>
</tr>
<tr>
<td></td>
<td>Ventricular septal defect</td>
<td>Hypoplastic left heart</td>
</tr>
<tr>
<td></td>
<td>Coarctation</td>
<td>Single ventricle</td>
</tr>
<tr>
<td></td>
<td>Atrial septal defect</td>
<td>Double-outlet right ventricle</td>
</tr>
<tr>
<td></td>
<td>Cardiomyopathy</td>
<td>Pulmonic stenosis</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Anomalous venous return</td>
</tr>
<tr>
<td>Skeletal</td>
<td>Sacral agenesis</td>
<td>Polydactyly</td>
</tr>
<tr>
<td></td>
<td>Vertebral and rib anomalies</td>
<td>Syndactyly</td>
</tr>
<tr>
<td></td>
<td>Limb reduction defects</td>
<td>Clinodactyly</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clubfoot</td>
</tr>
<tr>
<td>CNS</td>
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245
Figure 8.2.3: Pre-pregnancy weight gain graph. Reprinted with permission of Judith E. Brown, 1997 (Doberson DT, 1999)

Figure 8.2.4: Schematic illustration of vitamin C uptake and recycling in the cell. Vitamin C in its oxidized form, DHA, is transported into mitochondria via facilitative glucose transporter 1 and reduced to mitochondrial AA (ascorbic acid). Mitochondrial AA quenches ROS, protects the mitochondrial genome and inhibits mitochondrial membrane depolarization. The mechanisms involved in the uptake, trapping, and recycling of vitamin C in mitochondria appear to recapitulate the metabolism of AA in the cytosolic compartment (Sagun KC et al 2005).
Figure 8.2.5. A cartoon of tug of war illustrating hormonal action on blood glucose regulation (Satyanarayana U, et al. 2006)

Figure 8.2.6. Stages of the nutrition transition (Seymour L and Halpern MD, 2005)
8.2.7. Transcending reductionism in nutrition research: This represents the whole and the parts of diet and health. Starting from the top as whole, both diet and health may be reduced to parts (symbolized by the single rectangles and examples). The solid arrows indicate the usually studied relationships, and the dotted arrow indicates the relationship that should also be studied (Hoffman I, 2003)
Appendix 3:
the 12th Congress of the Association for Dietetics in South Africa and the 5th African Nutrition Epidemiology Conference
by UNICEF, ICCD and WHO. Trickle in water will be analyzed using
thrombin procedure.

Conclusion This study will add recent scientific information on iodine
status of pregnant women. Therefore it may help health professionals when
describing iodine intake for pregnant women.

Presenting Author: Mandiwana, TC
Co-author: Mabasa, E

THE PREVALENCE OF OBESITY AMONGST TEENAGERS
AT KGOLOUTHWA SECONDARY SCHOOL, CAPRICES
DISTRICT, SOUTH AFRICA

Introduction During the past 15 years, obesity has emerged as a significant
public health problem because of its increasing prevalence, as well as the
morbidity and mortality attributed to it.

Objective To determine prevalence of obesity amongst teenagers using
anthropometric measurements and dietary intake

Methods Descriptive study design was used to determine obesity and
dietary intake amongst male teenagers (n=15) and female teenagers
(n=12). The study was conducted at Kgoloouthwa secondary school.

Simple random sampling was used to select participants. The researcher
met individual participant in a separate place and asked them questions
while completing the questionnaires (Interviewed administered questionnaire).

Statistical package for social science was used to analyze data. Food Composition
Table was used to analyze dietary intake and descriptive statistics were
used to interpret data.

Results About 60% of male participants were overweight and 41% of
female were overweight. Obesity was more prevalent in females at about
35.5% and 26.6% in males. The mean value for carbohydrates was 145.91
for female participants and 130.9 for males. The mean value for fiber for
females was 241 and 397.01 for males.

Conclusion The prevalence of obesity and overweight at Kgoloouthwa secondary
school is high. Most of the participants were found to be consuming fast foods more frequently. The data that they consumed on daily
basis were low in micronutrients. Level of physical activity was very low, the
majority of the participants were exercising occasionally.

Key words: Obesity, overweight, prevalence, dietary intake

Presenting Author: Manusupula, S
Co-authors: Nyirepi, M.S.; Mokgatle, L.; Gobotsiwang KS

TRENDS AND DETERMINANTS OF CHILD MALNUTRITION IN
BOTSWANA BETWEEN 2000 AND 2007

Introduction The problem of under-nutrition persists despite conditions of
economic improvement in Botswana. Understanding the situation as well
as the determinants and the dynamics influencing child nutrition is
important.

Objectives To quantify the prevalence and trends of malnutrition among
under five children in Botswana between 2000 and 2007 using the 2006
World Health Organization standards.

Methods Using information from the 2006 Multiple Cluster Indicator Survey
and the 2007 Botswana Family Health Survey, data for 2005 and 2006
children respectively were available to compute estimates of underweight,
starving and wasting. To estimate trends across 2000 and the 2007 we
used one way classification analysis of variance test.

Results The prevalence of underweight significantly increased from 11% in
2000 to 11.1% in 2007 (p<0.05). Male children in the lowest wealth
score, the 12-23 months age group, and children whose care takers were
female or had lower forms of education were more likely to be stunted.
Ghanzi, Kgalagadi, and Kgalagadi had the highest prevalence of stunted.
Underweight varied by the child's age, residency and wealth status. There
were significant (p<0.05) differences in the prevalence of wasting by age,
wealth score, place of residence, and caregivers age. The rate of overweight
varied significantly by age, locality, and wealth score. The prevalence of low
birth weight differed significantly by gender of the household
and wealth score.

Conclusions Malnutrition is still a problem in younger children, those in
the lowest wealth score, and varied by district.

Key words: Botswana, malnutrition, underweight, stunting, wasting.

Presenting Author: Masoodi, H
Co-author: Kamat, TV

TRACs ELEMENT DEFICIENCY, RISKS IN PREGNANCY.
REVIEW OF ARTICLES PUBLISHED FROM 1987 TO 2010

Introduction Urbanization in developing countries comes along with
changes in food habits and living conditions resulting in increased risk of
non-communicable chronic diseases like diabetes A woman who has been
well nourished before conception, begins her pregnancy with reserves of
several nutrients so that the needs of growing fetus can be met without
affecting her health. Until recently there have been five published studies
which are focused on nutrients rather than glucose during pregnancy and
their deficiency outcome like gestational diabetes. A systematic review of
the literature was conducted as part of a comprehensive evidence report
for this problem.

Methods and Method Using Pub-Med bibliographic search engine, peer-
reviewed studies was identified on micronutrient deficiency and its clinical
outcomes during pregnancy. The following terms were searched: pregnancy
complications, trace elements, zinc, chromium, selenium, iodine, magnesium,
copper, magnesium and early programming; gestational diabetes.

Results Identified English articles that were published during the 23 years
period were studied. During the past decades, most of articles which have
documented in the field of nutrition and pregnancy, especially gestational
diabetes have focused on macronutrient intake (Energy and carbohydrates)
and on clinical outcomes such as Weight changes need for insulin administra
tion as well as maternal and infant outcome.

Conclusion While the importance in pregnancy of a few micronutrient
deficiencies such as iodine and iron, has been long recognized, the role
of many others being studied only recently. New approaches are needed
to encourage and support more researches in the area of trace elements
deficiency and risk of complications during pregnancy like gestational
diabetes; pregnancy induced hypertension, pregnancy wastage, low birth
weight, infertility, etc.

Key words: pregnancy, zinc, chromium, magnesium, iodine, trace elements;
micronutrient deficiency.
There is sufficient evidence that preconception care reduces the complications of pregnancy including pregnancy loss, birth defects and genetic disorders. The Reproductive and Child Health (RCH) programme offers a spectrum of services ranging from the Adolescent Reproductive and Sexual Health (ARSH) programme, ante-natal care (ANC) services and several interventions targeted towards perinatal and early neonatal morbidity and mortality reduction. There is however a "crack in the continuum" as there are few pre-pregnancy interventions. Every year, women enter pregnancy with teratogenic risk exposures such as micronutrient deficiencies, pesticide exposure or tobacco habit. What is the prevalence of these risk factors amongst adolescent girls and women of reproductive age? Are 800,000 pregnancies actually affected each year in India? If the pregnancy outcome is a stillbirth or results in early neonatal mortality, how do birth defects impact public health indicators? There are no government services for affected children and no education or support services for their parents. What is the quality of life of these children and their families? Can a low cost, population wide programme for prevention be suggested within the Reproductive and Child Health programme in India?

Registration Fees:
INR 1800 (general)
INR 900 (for students)

Venue:
MDC Auditorium
Yashwantrao Chavan Academy of Development Administration (YASHADA) Rajbhavan Complex,
Baner Road,
Pune-411 007

For further details please contact:
pphc2013@gmail.com
Supriya Phadnis (+91-9352004480),
Dr Swapnil Gadhave (+91-9966005148),
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Please check www.unipune.ac.in for the conference schedule
Pune Public Health Conference 2013

Pregnancy loss, birth defects and genetic disorders in India:
Epidemiology, social costs, health systems needs

11th - 12th February, 2013

Birth defects - Act today!
Pre-pregnancy body mass index, modifiable determinant of gestational diabetes

Hedyeh Masoodi* and C. S. Yajnik**

*PhD scholar, Health Science Department, University of Pune under guidance of Dr. C. S. Yajnik, and corresponding author: Hed.mas@gmail.com **Director Diabetes research center, KEM hospital

Background: Obesity among women of reproductive age is increasingly prevalent in urban Indians and is associated with increased risk of adverse outcomes for mother and infant, such as diabetes. Obesity in young women is contributing to Norbert Freinkel's 'fuel-mediated teratogenesis' in India and will contribute to intergenerational propagation of diabetes in young Indians.

Aims and Objective: The study investigated pre-gravid body mass index (BMI) as a risk factor for gestational diabetes mellitus (GDM).

Research design and methods: This is a preliminary report in a prospective cohort, using a nested matched case-control design, in two hospital settings in Pune city. The study is in progress. We determined pre-pregnancy weight by history and obtained height and weight gain during pregnancy. Glycemic status evaluated by random glucose and GDM was confirmed by a 75 g oral glucose tolerance test (OGTT) using IADPSG (International association of diabetes and pregnancy study group) criteria, using a threshold of fasting plasma glucose (FPG) 92mg%, 1hour180mg%, 2hour 153mg%.

Results: We analyzed results in 195 women, of which 158 had normal glucose tolerance and 37 were GDM. Gestational diabetes cases had higher pre-pregnancy BMI (26.71±4.35 vs. 22.27±4.21kg/m²), higher age (30±4.8 vs. 27.02±3.84 years) and a higher prevalence of family history of diabetes (53% vs. 39%). GDM women also had higher weight gain at the time of interview (8.82±1.47 vs. 6.87±1.53 kg) compared to non-diabetic control women.

Conclusion: The data suggest that GDM women have higher pre-gravid BMI and higher gestational weight gain compared to non-GDM women. Targeting women in reproductive age, for pre-conception life-style adjustments to normalize body weight might reduce the incidence of gestational diabetes and contribute favourably to reduction of diabetes epidemic in the country.
Pre-pregnancy overweight, modifiable determinant of gestational diabetes

Hedyeh Masood, PhD scholar, Health Science Department, Pune University.

Dr. C.S. Yajnik, Director of Diabetes Unit KEM Hospital

Research Guide: Dr. C.S. Yajnik, Co-Guides: Dr. K.J. Gayade, Dr. T.V. Kamat

February 2013

Methodology

In the study, we used an observation method to evaluate the effects of pre-pregnancy overweight on gestational diabetes risk. We conducted a retrospective study of women who delivered at KEM Hospital, Pune, India, between 1995 and 2013. Three groups were compared: women with pre-pregnancy overweight, normal weight, and underweight. The study population was stratified by age, parity, and diabetes status. Results showed that women with pre-pregnancy overweight had a significantly higher risk of gestational diabetes compared to those of normal weight. This study highlights the importance of pre-pregnancy weight management in the prevention of gestational diabetes.

Variables of study and distracting factors

- Pre-pregnancy weight
- Age
- Parity
- Body mass index
- Fasting blood sugar
- 2-hour postprandial blood sugar
- Gestational diabetes
- Hypertension
- Gestational hypertension
- Pre-eclampsia
- Fetal macrosomia
- Maternal complications during pregnancy
- Delivery mode
- Neonatal complications
- Postpartum diabetes

Conclusion

Our data support that pre-pregnancy overweight is a significant risk factor for gestational diabetes. This finding underscores the importance of weight management during pregnancy to reduce the risk of complications for both mother and child.

Acknowledgments

The authors wish to thank all the participants who contributed to this study. Special thanks to the KEM Hospital staff for their support.

References


Health science department, Pune University:

Dr. A. Murukkar, Dr. T. S. Jadhav

KEM Hospital:

Dr. C. S. Yajnik, Late Prof. Dr. S. M. Shet, Professor of Obstetrics and Gynecology

The University of Pune, Pune, India
Dear Hedyeh,

Thank you very much for your response to our Call for Papers and for submitting such an interesting proposal.

On behalf of the Steering Group I am delighted to say that you and your colleagues’ paper has been ACCEPTED for presentation at the 2nd Global Conference "MAKING SENSE OF: FOOD", to be held in Athens, Greece, from Monday 4th NOVEMBER to Wednesday 6th NOVEMBER 2013. I look forward with great interest to meeting you and to hearing your paper.

If there is anything further we can do, please do not hesitate to contact us.

Don Sanderson
Rob Fisher

Joint Organizing Chairs

Making Sense of Food 2 - Athens

All communications for IDNet to:

Priory House
149B Wroslyn Road,
Freeland,
Oxfordshire, OX29 8HR
Tel: +44(0)1993 882087
Fax: +44(0)8074 601132

Company Information.
Registered in England No: 05494488
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WDC 2013 Melbourne - Abstract accepted by title

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To: mahed.mahed@yahoo.com, jessica.pledge@idf.org

10/07/13

Abstract number: ME-0913
Abstract title: Intake of high oxygen absorbance capacity (horac) foods in second trimester and risk of development of gestational diabetes

Dear Ms Masoodi,

On behalf of the Programme Committee of the World Diabetes Congress 2013 Melbourne organised by the International Diabetes Federation, it is my pleasure to inform you that your abstract has been accepted by title.

Your abstract will be published on the abstract CD-ROM and the title will be published in the congress programme book.

Should the registration process be incomplete by this date, the abstract will not be published and will be removed from the programme.

All correspondence should be sent to my attention through Jessica Pledge, the Congress Programme Administrator.

With best wishes,

Professor Paul Zimmet AO
Chair, Programme Committee
Abstract Confirmation - 8th World Congress on Developmental Origins of Health and Disease

From: DOHaD 2013 Abstract
To: hed_ms@yahoo.com
Dear Ms Hedyeh MASOODI,

Thank you for submitting an abstract for the 8th World Congress on Developmental Origins of Health and Disease to be held in Singapore on the 17 - 20 November 2013.

On behalf of the Abstract Review Committee, we are pleased to inform you that the following abstract has been accepted for POSTER presentation:

Submission Number: DOHaD13-1644
Abstract Topic Name: Gestational diabetes
Title: VITAMIN C DEFICIENCY IN SECOND TRIMESTER AND RISK OF DEVELOPMENT OF GESTATIONAL DIABETES

All information regarding your abstract, authors and their affiliations will be considered as final as of the 12 August and will be submitted for the abstract book.

Please do not hesitate to contact us if you need further assistance. Kindly email us at dohad2013.hotreg@mci-group.com (registration) or dohad2013.abs@mci-group.com (abstract presentation).

Kind Regards
Karen Ukil
DOHaD 2013 Abstract Management Team
C/O MCI Group Asia Pacific Pte Ltd
Singapore
برادر / خواهر کرباسی حمید مقدمی
دانشجوی محترم دوره دوم

بدیع‌نبویه از نلاتش‌های شما فرهنگه عزیز عرضه علم و فهم‌گر در
براسای اهداف سند چشم آن‌درا می‌توان و نقضه جامع علمی کشور تقدیر
می‌شود. از امکانات سرمایه‌ای شما نجات همت و نلاتش یان و فرحه ای است که
در قاب ارزشمند علم و دانش می‌نشیند و امید است همبوده از طلاهه
داران نهضت تولید علم ایران اسلامی باشد. انشاء...
تکریم جهانگیر هاشمی، موفقیت‌ها و کوشش‌های مثبت و جهادی او به سمت کسب دانش و علمی می‌شود،

(طامع معظم رحمت حضرت آیت‌الله هاشمی فقیه العالی)

دانشجوی عزیز سوکار خالیه همی‌سمو از حضور فعال جناب‌الاحسن را در جشنواره‌ی انتخاب دانشجویان برتر علمی شهیاب، به عنوان یکی از دانشجویان مسئول و صحیح‌الشکوه، ارج می‌نماید و از اینکه با توانایی و پیشرفت و اعتماد به نفیس توانسته ای در سطح‌های علمی و دانش بی‌درختی، صمیمانه به شما تبریک می‌گویم. این اتحاد امتیاز به پاس شایستگی‌های علمی به جناب‌الاحسنی، قبیلیت می‌گردد.

انشاء اللهد فی آنها، ی نزدیکت نامتیان به عنوان یکی دانش ایرانی در سطح جهان

بپذیرم.

[signature]

رازن علمی و مسئولیت دانشجویان ایرانی
در هن و کشورهای شهیاب

دی ماه 1392 - 11 رمضان 1434 - ده ماه 1395
Certificate of participation

This certificate is awarded to

HEDYEH MASOODI

For participating in workshop

"SPSS FDP on Research and Data Analysis Using SPSS 18.0"

at Department of Physical Education,

University of Pune on October 22nd – 23rd, 2010

Dr. Narain Nikam
HEAD, DEU, U.P.
Certificate of Completion
The National Institutes of Health (NIH) Office of Extramural Research certifies that Hedyeh Masoodi successfully completed the NIH Web-based training course "Protecting Human Research Participants".
Date of completion: 08/16/2011
Certification Number: 727527
CERTIFICATE OF PARTICIPATION

This certificate is awarded to

for participating in the workshop on 'Orientation to Statistical Methods in Research' on 15th June, 2013 at Pune.

Date: June 15th, 2013

Dr. (Mrs.) Shobha Rao,
Director, Research & Training

CERTIFICATE OF PARTICIPATION

This certificate is awarded to

for participating in the workshop on 'Scientific Writing' on 27th July, 2013 at Pune.

Date: July 27th, 2013

Dr. (Mrs.) Shobha Rao,
Director, Research & Training
CERTIFICATE OF PARTICIPATION

This is to certify that Dr./Mr./Ms. [Name], [Title], has attended the “Pune Public Health Conference 2014 – IPHA-IAPSM Joint State Conference” organized by the Interdisciplinary School of Health Sciences, University of Pune on the 25th & 26th February 2014.

President
IPHA

Convenor
IAPSM
From adeindiajournal@gmail.com
To Me
29 April 2014, at 3:20 PM

Dear Ms. Hedyeh Masoodi
We have received your article titled 'A comparative study on characteristics of gestational diabetes versus normal glucose tolerant Indian pregnant mothers' for Journal of Diabetes Education, ISSN: 2320-9968.
Your article has been published in Issue 4, October-December, 2013.

Thanks and Warm Regards,
Prof (Dr).H. B. Chandalia
Editor-in-Chief
A comparative study on characteristics of gestational diabetes versus normal glucose tolerant Indian pregnant mothers:

Authors: H. Massodi¹, S. Rao², T.V. Kamat ³

¹. Corresponding Author, School of Health Sciences, University of Pune, mahed.mahed@yahoo.com
². Director Research and Training, Society for Initiatives in Nutrition and Development
³. Visiting Faculty, School of Health Sciences, University of Pune

Abstract:

Aims and objectives: To compare clinical features of gestational diabetes (GDM) and normal glucose tolerant group of Indian mothers.

Method: Forty two pregnant women with GDM and 158 gestational age-matched healthy pregnant women participated in this study at an average of 26 weeks of gestation. Antenatal information was obtained from hospital records. Height and weight were measured at the time of interview. BMI was elected as the only measure of obesity. Holmes and Rahe stress questionnaire was used to assess total life stress unit during pregnancy. Pre-pregnancy physical activity level was calculated using international physical activity questionnaire. GDM was diagnosed by 75 gm oral glucose tolerance test using International Association for Diabetes in Pregnancy Study Group criteria.

Results: GDM mothers had higher pre-pregnancy body mass index i.e. BMI (26.5±4.3 vs. 22.2±3.9 kg/m²), higher age (29.2±4.6 vs. 26.9±3.8 years), higher prevalence of family history of diabetes (61.9% vs. 39.3%) higher parity (59.6 vs. 38.6%) and higher rate of large for gestation (LGA) babies (38.1 vs. 8.2 %). GDM subjects also had higher weight gain at the time of interview (8.88±2.1 vs. 6.85±1.6 kg), higher total life change unit of stress [median (IQR), 60 (50-80) vs. 35 (35-45)], and lower pre-pregnancy physical activity score [median (IQR), 300 (250-360) vs. 1329 (1121-1585)].

Conclusion: The present study confirmed conventional risk factors for GDM and additionally highlights the role of physical activity and stress. Targeting women in reproductive age, for pre-conception life-style adjustments to normalize body weight might reduce the incidence of gestational diabetes and contribute favorably to reduction of diabetes epidemic in the country.

Keywords: GDM, BMI, OGTT, stress, physical activity
Introduction:

Gestational diabetes mellitus (GDM) is carbohydrate intolerance of variable severity with onset or first recognition during pregnancy [1]. Gestational diabetes is a complication in about 5% of all pregnancies, also is increasing in prevalence, and is associated with complications of pregnancy and a long term risk of diabetes in both mother and off spring [2-6]. Prevalence of gestational diabetes in India is high but variable in different states, e.g. 16-17% in Tamil Nadu and 10% in Punjab [7].

It is already well known that higher body mass index (BMI) and sedentary life style are relative risk factors for GDM. Although GDM can be influenced by both genetic and environmental factors, the rapid increase in prevalence might be attributable to environmental causes. Among all risk factors for GDM, maternal overweight, and type of life style (as modifiable risk factors), seem to be crucially important. A number of studies have demonstrated a significant association between pre-pregnancy BMI and GDM [8-10].

Traditional risk factors for GDM with recent attention have been reported to be body fat percentage [8, 9, 11]. Similarly, family history of diabetes also has been shown to be a risk factor for GDM in case of Indian [10], Chinese [11] and other populations [15]. Additionally, diet especially calories and physical activity have also been shown to be associated with risk of GDM in different populations [9, 12, 13, 14]. In addition advanced maternal age and history of spontaneous abortion were also novel risk factors in Chinese population [11]. Grand-multi-parity was predictive too of future risk of diabetes in Caucasian and African-American population [16], and multiparous women were more likely to have GDM than nulliparous women [17].

Modest changes in pre-pregnancy BMI may decrease the risk of GDM substantially [8]. But, it is recognized that pre-pregnancy BMI and gestational weight gain depend on different metabolic pathways. Pre-pregnancy BMI represents maternal nutritional conditions before conception, while gestational weight gain is the expression of fetal-maternal physiological changes combined with genetic and nutritional factors [18], and especially in early pregnancy is associated with higher rate of GDM. Weight gain especially in early pregnancy is associated with higher rates of GDM [19]. The women suffering from GDM during previous pregnancy have higher risk for type two diabetes recurrences [20]. However, there is hardly study showing that previous history of polyhydraminos increases the risk of GDM.

Although, stressful events during pregnancy have been reported as an independent risk factor for GDM [21] only by few researchers, it needs attention as it is a potentially modifiable risk factor. All above could indicate that not all factors are modifiable for reducing risk of GDM. Nevertheless, physical activity level, dietary habits and management of stress certainly offer the opportunity for modifying and consequently reducing the risk for GDM as very few studies have examined their role especially in Indian women.
Material and methods:

Pregnant women of 24-28 weeks of gestation attending antenatal clinic from two hospital setting were studied. Women with singleton pregnancy, without any serious health problem or co-morbidities and willingness to participate were included. Present study was approved by Ethics Committee of King Edward Memorial Hospital Research Center. GDM was diagnosed by OGTT using International association of diabetes in pregnancy study group (IADPSG) criteria [22] (fasting >=92mg%, 1 hour post glucose >=180mg%, 2 hour post glucose >=153mg %).

Measurements:

Maternal information was obtained from outpatient records as well as face to face interview. The questionnaire contained six segments including maternal demographic information, obstetric and medical history, antenatal information and anthropometric measurements, life stress during pregnancy and pre-pregnancy physical activity history.

Maternal height and weight were measured in duplicate to assure accuracy. Tanita body analyzer (model BC, 601) was used to measure the weight of pregnant mothers and a plastic stadiometer was used to measure height. Mean of two measurements was used in analysis. Pre-pregnancy BMI was estimated by weight in kilogram divided by square of height in meter. Indian women classified as obese according to World Health Organization (WHO)'s recommended cut off for BMI for Asians. According to WHO BMI criteria, the range for normal BMI was 18.5-23 kg/m whereas BMI 27.5 kg/m was considered obese [23].

Information regarding usual physical activity of mother prior to present study was obtained by using interview technique. The mother was asked the type of activity and duration of each activity during at least seven days prior to confirmation of present pregnancy.

Pre-pregnancy physical activity was measured using short form of International questionnaire for physical activity [24].

Data from the short International physical activity questionnaire (IPAQ) were summarized according to the physical activities recorded (walking, moderate, and vigorous activities) and estimated time spent sitting per week. Note that the sitting questions were developed as separate indicators and not as part of the summed physical activity score.

The weighted MET [(metabolic estimation rate)-minutes per week (METmin-wk⁻¹)] were calculated as (duration × frequency per week × MET intensity), which were summed across activity domains to produce a weighted estimate of total physical activity from all reported activities per week (MET-min-wk⁻¹). For brevity and clarity of presentation, only the total physical activity MET-minutes per week are reported [25]. The formulas were as follows:

Vigorous (minute/week) = 8 × vigorous activity (minute) × vigorous activity days
Moderate (minute/week) = 4 × moderate intensity activity (minute) × moderate intensity activity days

269
Walking (minutes/week) = 3.3 \times \text{walking (minute)} \times \text{walking days}

Total physical activity MET (minute/week) = \text{vigorous} + \text{moderate} + \text{walking}

Sitting calculated as minutes of sitting on a week day, including any type of sitting like, reading, travelling by bus, visiting friends, doing course works, etc, and presented as sedentary score.

As there are no established threshold for presenting MET-minute the IPAQ committee decided that data should be reported as comparisons of median values and inter-quartiles ranges for different population.

Only values of 10 or more minute activities were included in the calculation. Scientific evidence indicates that episodes of at least 10 minutes are required to achieve health benefits. Responses less than 10 minutes were considered as zero [26].

In this study, stress was considered as confounder variable. To evaluate stress level, an international standardized questionnaire of social readjustment rating scale (SRRS) was used [27]. This scale was retested by Rahe et.al in 1970 and also in the year 2000 as a predictor of illness. In addition this scale was assessed cross-culturally, in Japanese and Americans [28], and Malaysians Americans [29]. Consequently, considering the diverse samples in these studies, Rahe and Holmes life stress questionnaire has reasonable measurement properties for monitoring population levels of stress among 18- to 65-yr-old adults in diverse settings.

However questionnaire was modified to suit the present study population. Both negative and positive events were included in the questionnaire. The extent of required adjustment was indicated in terms of stress score.

To measure stress according to Holmes and Rahe stress scale, the number of total life change units (TLCU) that applied to events in the past year of an individual’s life were added and the final score was given a rough estimate of how stress affect health. Recently this questionnaire was used to assess stress in Iranian population to estimate maternal stress in pregnancy [30].

The subjects were asked that “during the last twelve months has she had any of the following things happen to her. If so, simply circle the number following those items which has occurred in her life recently (and only those items that apply to her)”. Stress category was determined using following categories; scores greater than 300, major life stress, scores between 200-299 and 150-201 moderate life stress and mild life stress respectively and scores less than 150 indicates low life stress. Since this part comprised of some delicate questions, coded questionnaire was provided separately to the subjects, to keep confidentiality. As there are no established thresholds for presenting stress score data was reported as comparisons of median values for this population.

**Statistical methods:**

The relationship between maternal clinical history and risk of GDM was explored. Estimates are expressed as mean ± SD or proportions. To compare means of continuous variables, independent t-test, and
χ² test were used to test differences in proportions. For skewed data log transformation was undertaken for conversion to normality. Z-score were calculated to find out whether study variables were associated with onset of GDM. Analysis was carried out using SPSS Microsoft IBM version21.

**Results**

Our results of conventional risk factors for GDM (Higher age, BMI, parity, neonatal complications) as depicted in table one, are consistent with previous observations [10]. Mean values for various maternal characters studied are given for GDM and NGT mothers in table 1. It can be seen that GDM mothers were older by three years and had significantly higher pre-pregnancy BMI (26.5±4.3 Vs 22.2± 39.9; p<0.001) compared to NGT mothers. Further, they also had significantly higher weight gain during pregnancy (13.8 ± 5.3 kg Vs 11.5 ± 2.9 kg; p<0.001). Proportion of women with history of diabetes, or abortion, or polyhydraminous or even that of GDM did not differ significantly among GDM and NGT group. Maternal parity was not associated with risk of GDM. It was however interesting to note that the median scores for activity were low while that for stress were higher among GDM mothers compared to NGT mothers.

**Discussion**

Our results of conventional risk factors for GDM were consistent with previous observations; extracting from t-test, chi-square and z score; including higher age and BMI [10], parity [17], family history of diabetes [10, 11, 16], advanced age [11], higher gestational weight gain [18], and pre-pregnancy BMI [18]. However, maternal history of abortion was not associated with GDM in contrast with findings of Yang H et.al, 2009 [11]. There was no relation between polyhydraminous and GDM, and borderline association between previous GDM and risk of GDM in next pregnancies.

Strengthening current research findings, Liu J, et.al, 2008 [14] have shown that higher level of physical activity during pregnancy leads to lower risk of GDM among previously inactive women. Also Dye TD et.al in 1997[31] reported lower percentage of physical inactivity in GDM subjects.

Torloni M.R et.al [32], meta-analysis based on 70 studies reported in last 30 years, strengthen that the risk of GDM is positively associated with pre-pregnancy BMI which was in line with our results. In another study, Kongubol A et.al [33], found that compared to normal weight women, obese Thai women (without metabolic problems) were not at increased risk for gestational diabetes mellitus (RR = 0.9 [95% CI 0.6–1.4]). Also Radesky JS et.al [34] in their study concluded that nutritional status on entering pregnancy as reflected by pre-pregnancy BMI is a stronger predictor of abnormal glucose tolerance than any dietary influences during early pregnancy. This prediction is in case of specific type of carbohydrate (whole grain) and fat (polyunsaturated fatty acids) and not whole carbohydrate and fat intake. Diet quality may influence DM and GDM incidence over the long term. And the relatively short duration of a single pregnancy may not allow time for diet to affect the risk of GDM. Hence they suggest that efforts to reduce rates of GDM should focus on reducing obesity prevalence among women of child-bearing age.
Hanley AJG et al [35], has suggested the presence of a diabetes-prone phenotype within the nulliparous sub-cohort of their study population, which might contribute to infertility, seems to be contrary findings from present study. The subjects with history of higher parity were more prone to get GDM. In another study by Nicholson WK, et al [16], it is reported that multi-parity is predictive of future risk of diabetes after adjustment for confounders; however they did not assess the predictive effect of parity on GDM.

The rapid global rise in prevalence of type 2 diabetes constitutes a health threat to the individual and is a major burden for health economy. Therefore not only it is crucial to identify specific risk groups, targeting preventive strategies [36], but also an urgent need for safe low cost strategies to halt the diabetes epidemic is necessary.

Yet in commonly identified risk factors for GDM including maternal age, high parity, family history of diabetes, over weight status and obesity extent to which these factors contribute to the etiology of the disease is largely unknown.

Considering two facts that “India is passing through nutritional and lifestyle transition” and “GDM is long term risk for both mother and fetus to develop diabetes in later life”; this study revealed that conventional risk factors for GDM persevere. Hence our observations on the modifiable risk factors assume importance.

Ascertainment of causality was not possible due to observational nature of study. Targeting women in reproductive age, for pre-conception lifestyle adjustments, comprise of normalizing body weight, increasing physical activity and management of stress might reduce the incidence of gestational diabetes and contribute favorably to reduction of diabetes epidemic in the country.

Table 1. Maternal nutritional status and physical activity

272
Table 2. Maternal clinical characteristics:

<table>
<thead>
<tr>
<th>Maternal parameters</th>
<th>GDM (n=42)</th>
<th>NGT (n=158)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-pregnancy BMI (Kg/m²) (mean ± SD)</td>
<td>26.5±4.3</td>
<td>22.2±39.9*</td>
</tr>
<tr>
<td>Weight gain during pregnancy (Kg) (mean ± SD)</td>
<td>13.8±5.3</td>
<td>11.5±2.9*</td>
</tr>
<tr>
<td>pre-pregnancy physical activity score median (IQR)</td>
<td>300 (250,360)</td>
<td>1329* (1121,1585)</td>
</tr>
</tbody>
</table>

*p=0.00 using independent t-test

Table 3. Maternal total life change unit (TLCU), stress score

<table>
<thead>
<tr>
<th>Maternal parameters</th>
<th>GDM (n=42)</th>
<th>NGT (n=158)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total life change unit (TLCU), stress score median (IQR)</td>
<td>60 (50,80)</td>
<td>54* (35,50)</td>
</tr>
</tbody>
</table>

*p=0.00 using independent t-test

Duality of interest:
The authors declare that there is no duality of interest associated with this manuscript.

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Literature cited:


TO WHOM SO EVER IT MAY CONCERN

This is to certify that Ms. Hedych Masoodi is PhD student at School of Health Sciences, University of Pune. Her area of research project is in clinical nutrition.

Her research topic is as following: "Elucidation of the role of maternal nutrient status during pregnancy with emphasis on selected antioxidants, on glycemic status and pregnancy outcome".

Professor Bhushan Patwardhan
Director, School of Health Sciences