



सत्यमेव जयते



National Guidelines for Calcium Supplementation During Pregnancy and Lactation



Maternal Health Division
Ministry of Health & Family Welfare
Government of India

December 2014

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Preface



Quality Antenatal Care is the cornerstone to improved maternal health and a crucial challenge that is faced by every health care setting especially in a country like ours. An essential measure for overcoming this challenge is to equip the staff with appropriate knowledge and skill sets so that they are able to provide the best care possible at the right time and in the right place.

I am happy to note that the Government of India took a decision to empower and equip the Auxiliary Nurse Midwives (ANMs) with appropriate knowledge and skills to prevent Preeclampsia / Eclampsia with Calcium supplementation during pregnancy and lactation.

These guidelines have been developed after taking cognizance of scientific evidence and considerable consultation with domain experts which are expected to serve as a handy tool for both policy makers and programme managers, giving step by step guidance on initiating and implementing this strategy. It will also equip the ANMs and all the frontline health care workers with the ability and knowledge on how to carry out key activities that will prevent maternal mortality & morbidity due to hypertensive disorders.

I sincerely hope that these guidelines will be implemented both in letter and spirit in order to ensure quality ante-natal care services in order to accelerate reduction in maternal morbidity and mortality

(Lov Verma)



C.K. Mishra, IAS

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Dated: 17th November, 2014

Foreword



“A Strategic Approach to Reproductive, Maternal, Newborn, Child and Adolescent Health (RMNCH+A)” in India has brought about a paradigm shift in the delivery of health care services. However, maternal mortality still remains a crucial challenge. We stand firmly committed to reducing maternal mortality & morbidity in India and are making relentless efforts to overcome this challenge.

As, Programme Managers, we are all aware that one of the leading causes of maternal mortality is hypertensive disorders during pregnancy which can lead to pre-eclampsia and a considerable amount of child and maternal morbidity and mortality is associated with this condition.

It is in this context that the Ministry of Health & Family Welfare has taken a decision to adopt a preventive strategy for pregnancy induced hypertensive disorders. Key intervention in this strategy is universal supplementation of Calcium to all pregnant women across India.

This guideline will be useful for the states in universal supplementation of calcium during pregnancy and in post-natal period. I am confident that this simple measure will go a long way in bringing us closer to our goal of reduce maternal mortality and morbidity and the states as our key partners will implement these guidelines in true letter and spirit.

Since enabling support systems is essential for seamless implementation of this strategy, I would also request the states to ensure that appropriate mechanisms for training, monitoring and operationalising of this initiative are put in place at the earliest.


C.K. Mishra



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Foreword



Majority of deaths due to pre-eclampsia and eclampsia are preventable with the provision of timely and effective care during pregnancy and child birth. Optimising health care to prevent and treat women with hypertensive disorders is a necessary step towards achieving the Millennium Development Goals.

Considering the high prevalence and mortality caused by the hypertensive disorders amongst pregnant and lactating women in India; need for an additional preventive strategy was felt. Based on the WHO recommendation and global evidences, the use of calcium supplementation to pregnant and lactating women for preventing pregnancy induced hypertensive disorders has now been included in the Government of India's ante-natal care (ANC) and post natal care (PNC) package.

Maternal Health Division of MoHFW convened a series of meetings with different experts and after detailed deliberation drafted the present guidelines to incorporate routine calcium supplementation during pregnancy and lactation. These guidelines have been made as simple as possible to facilitate easy implementation.

These guidelines clearly articulate the technical aspects of the use of Calcium to prevent pre-eclampsia and its effect on maternal and new born health and outline the operational aspect of rolling out this intervention as a part of the ANC package.

I express sincere appreciation to all the experts who have put their best efforts to draft these guidelines. I am confident that these guidelines will not only provide direction to all service providers in implementation but also contribute immensely towards safe motherhood and new born health in India.


(Dr. Rakesh Kumar)



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Programme Officer's Message



Maternal Health Division, Department of Health & Family welfare had come out with comprehensive technical and operational guidelines on Calcium Supplementation for prevention of hypertensive disorders during pregnancy. These guidelines have been the result of series of deliberations with the members of expert group and development partners.

I would like to express that these guidelines would not have been possible without the constant encouragement from Mr. C.K Mishra, AS & MD & Ms Anuradha Gupta, Ex AS & MD. Dr. Rakesh Kumar, Joint Secretary (RMNCH+A) headed the expert group meeting and gave valuable inputs in framing this guideline.

I would like to acknowledge the contribution of all members of the Expert Group in developing the content of these technical and operational guidelines. I would also like to acknowledge my colleagues in MH Division especially Dr. Dinesh Baswal, DC (MH) and development partner's for their valuable efforts and inputs in developing this document.

The calcium supplementation needs to be incorporated as part of regular ANC & PNC. This has a potential to avert large number of maternal deaths due to Eclampsia alone. I wish success and extend unstinting support towards implementation of this initiative by the States and UTs.

Himanshu Bhushan
12.12.14

(Dr Himanshu Bhushan)

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List of Abbreviations

ANC	Antenatal Care
ANM	Auxiliary Nurse Midwife
ASHA	Accredited Social Health Activist
AWW	Anganwadi Worker
CHC	Community Health Centre
CI	Confidence Interval
DH	District Hospital
DPT	Diphtheria, Pertussis and Tetanus
Gol	Government of India
HMIS	Health Monthly Information System
IEC	Information Education Communication
IFA	Iron Folic Acid
MC	Medical College
MCTS	Mother and Child Tracking System
MO	Medical Officer
NNM	Neonatal Mortality
NNMB	National Nutrition Monitoring Bureau
PHC	Primary Health Centre
PNC	Postnatal Care
PW	Pregnant Women
RCT	Randomised Control Trials
RDA	Recommended Dietary Allowances
RR	Relative Risk
SBA	Skilled Birth Attendants
SN	Staff Nurse
UTI	Urinary Tract Infection
VHND	Village Health Nutrition Day
WHO	World Health Organization

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Dietary requirement for different nutrients increases during pregnancy and lactation. The dietary intake of many Indian women, however, is significantly below recommended dietary requirements. Of these, two most important nutrients are iron and calcium.

Adequate calcium intake during pregnancy and lactation has the potential to prevent pre-eclampsia, pre-term birth, neonatal mortality (NNM), improve maternal bone mineral content, breast milk concentration and bone development of neonates. While there are national guidelines on maternal iron supplementation, there are no national guidelines available for calcium supplementation. There are only some states that have included low-dose calcium (<1g/d) as part of antenatal and postnatal services.

2.1 International evidence

Various international evidences are available on the benefit of daily maternal calcium supplementation during pregnancy. These include the Lancet 2013 series in maternal and child nutrition, several meta-analysis, WHO 2011 and WHO 2013 guidelines and the 2014 Cochrane systematic review. A summary of these evidences is that the daily intake of at least one gm/day of calcium in pregnancy after the first trimester reduces the risk of pre-eclampsia by at least 50%, with an additional 24% reduction in the risk of pre-term birth.

For prevention of pre-eclampsia, WHO 2013 guidelines recommend inclusion of routine prenatal calcium supplementation in high doses (>1 gm/day), especially in areas where dietary calcium intake is low.

2.2 National evidence

The daily recommended dietary allowances (RDA) for calcium in pregnancy and lactation is 1200 mg per day. The National Nutrition Monitoring Bureau (NNMB) - 2012 data from 10 Indian states shows that the daily calcium intake during pregnancy and lactation for Indian women is less than 30% of RDA (which means it is only 400 mg/d). This shows that most pregnant and lactating women in India have low dietary calcium intake.

2.3 Need for national guidelines

Considering the poor dietary calcium intake among pregnant and lactating women in India, high prevalence of hypertensive disorders in pregnancy and to maintain uniformity in dosage of maternal calcium supplementation across the country, there was an urgent need to formulate our own guidelines for calcium supplementation during pregnancy. Moreover, there is ample universal evidence that calcium supplementation in pregnancy reduces incidence of pre-eclampsia and other hypertensive disorders in pregnancy.

Therefore, an expert group was constituted to deliberate on calcium supplementation in detail and to formulate guidelines for India. The present guidelines have been prepared based on the recommendations of these experts and available national/international evidences.



Technical guidelines for Calcium supplementation in pregnancy

3.1 Target population

- All pregnant women in the community.
- Individual states are free to implement this programme across the states in a phased manner.
- All health facilities and outreach points in the state/district have to be covered.

Aim:



To contribute to the reduction of maternal morbidity and mortality

Objective:



To reduce the incidence of hypertensive disorders of pregnancy by routine calcium supplementation

To provide a protocol for calcium supplementation and operational details of this programme

3.2 Protocol for calcium supplementation

- All pregnant and lactating women to be counselled about intake of calcium rich foods.
- **Oral swallowable calcium tablets to be taken twice a day (total 1g calcium/day) starting from 14 weeks of pregnancy up to six months post-partum.**
- One calcium tablet should be taken with the morning/afternoon meal and the second tablet with the evening/night meal. It is not advisable to take both calcium tablets together as > 800 mg calcium interferes with iron absorption. Calcium tablets should not be taken empty stomach since it causes gastritis.
- Calcium and Iron Folic Acid (IFA) tablets should not be taken together since calcium inhibits iron absorption. IFA tablets should be taken preferably two hours after a meal.
- Each calcium tablet should contain 500 mg elemental calcium and 250 IU vitamin D3. The preferred formulation for calcium is calcium carbonate. The rationale for inclusion of Vitamin D is to enhance the absorption of calcium.

3.3 Specifications of calcium & Vitamin D3 from IP

- Calcium carbonate salts to be used.
- Swallowable tablets of 500 mg elemental calcium and 250 IU Vitamin D3 in each tablet to be taken with meals two times a day.

3.4 Side effects & contraindications

- None, within the recommended limit (1gm/d).
- A small proportion of women may experience mild gastritis so calcium tablets should be taken with meals.
- Excessive consumption of calcium (>3 gm/d) may increase the risk of urinary stones and Urinary Tract Infection (UTI) and reduce the absorption of essential micronutrients.



4 Operational aspect of the programme







4.1 Roll- out plan

- The programme will be implemented in all states, at all levels of contact of pregnant women (PW) with the health system, such as Village Health & Nutrition Days (VHNDs), sub-centres, primary health centres (PHC) in urban and rural areas, community health centres (CHC), sub-district hospitals, district hospitals (DH), and medical colleges (MC).
- The service provider and programme officer must be oriented and trained about the programme.

4.2. Strategy for implementation

It is recommended that calcium be given to all PW after the first trimester till six months after delivery.

- During pregnancy, 360 tablets are required per woman (@ 2 tablets per day from 14 weeks to 40 weeks = 26 weeks = 182 days) and 360 tablets in the first six months of the postnatal period (@ 2 tablets per day for 6 months).
- ANM to distribute calcium tablets along with IFA tablets to all pregnant women as per the following proposed schedule, which can be adapted to the state context:

When	How many	By whom	Where
 Second ANC	 12 strips (@ 15 tablets per strip)	ANM	ANC clinic/VHND
Third ANC	 12 strips (@ 15 tablets per strip)	ANM	ANC clinic/VHND
 At the time of zero dose of polio for the infant	 12 strips (@ 15 tablets per strip)	ANM	Immunization clinic/VHND
At the time of third dose of Diphtheria, Pertussis, and Tetanus (DPT) for the infant	 12 strips (@ 15 tablets per strip)	ANM	Immunization clinic/VHND

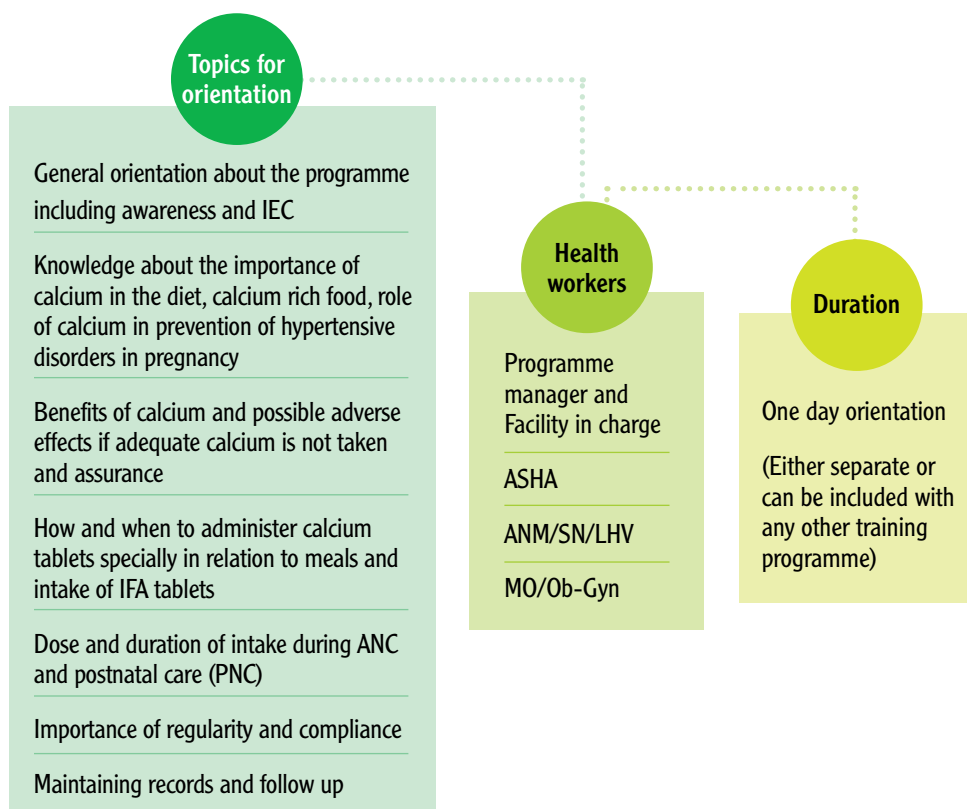
- If the woman delivers at home or doesn't come to the ANC clinic, the ASHA has the responsibility to deliver the calcium tablets at the beneficiary's home.
- Appropriate counselling of the target group to be done by the designated counsellor/staff/service provider at the time of distributing the tablets. Counselling must emphasise the benefits and protocol of calcium intake including the appropriate time at which to take calcium and iron tablets.
- The total number of calcium tablets required for a district should be calculated accordingly at the district level, after taking into account the total number of pregnant women registered for ANC and a 10% add on.

4.3. Capacity building of health personnel for calcium supplementation in pregnancy

Activity	General orientation about the programme including awareness and Information Education Communication (IEC)	Counselling and motivation	Knowledge of calcium supplementation, dosage, timing of administration in pregnancy	Maintaining records and follow up
Health personnel				
ASHA	√	√	√	√
ANM/SN/LHV	√	√	√	√
MO/ObGyn	√	√	√	√
State/District Programme Manager & Facility in charge	√		√	√

- One-day orientation programme, based on the guidelines, should be organised for the district and block level programme officers. During this orientation programme, planning for necessary logistics and training of healthcare workers should also be done.
- Ideally, the training of healthcare workers for calcium supplementation of pregnant women should also be integrated with other training programmes, such as the training for deworming during pregnancy.
- Training for this component should be included in the training module of ASHAs as well as the training programmes of skilled birth attendants (SBA).

4.4 Training/ Orientation



Batch size

- Districts to be mapped for all delivery points.
- All cadres of staff working at different levels of facilities but involved in providing ANC need to be oriented.
- Priority to be given to health personnel of all delivery points for training and orientation on rotation basis.
- Stand-alone training for calcium supplementation might not be needed, thus, orientation programme can be done during existing review meetings at states/districts/blocks/PHCs, or it may be combined with any other training programme.
- If separate training is to be organised, one batch can have 50-100 trainees from all cadres.
- One batch of trainees will consist of
 - ◆ Programme Manager
 - ◆ ANM/SN/LHV
 - ◆ MO/Ob-Gyn.
- District Training-in-charge will accordingly prepare the training plan and calendar.
- ASHAs to be trained separately during any ongoing training programme.

Training site

Prerequisites

- Seminar/Conference Room with a capacity of around 100 participants
- Audio visual (AV) aids and other training aids

Any DH/CHC which has the above prerequisites/is able to arrange the above prerequisites can be chosen as a training site

Trainers

- Ob-Gyn/MO/Counsellor to be included as trainers
- Half day Training of Trainers (TOT) can be organised for 20-25 trainers at state level

Training material

- Gol guidelines on calcium supplementation
- Any other teaching or training material synchronised with Gol guidelines

Training methodology

- Job aids/posters/handouts Presentations

4.5 Community linkages

- State contextualisation of the national guidelines during state level meeting
- Inclusion of calcium in antenatal and postnatal services protocol/package
- Inclusion of calcium in the essential drug list and sub-centre kit
- Development of state-specific procurement guidelines
- Appropriate media and IEC campaign to increase awareness about the programme on a periodic basis
- Availability of calcium at all chosen facilities and availability at sub-centre
- Inclusion of calcium supplementation indicator in programme monitoring in Health Monthly Information System (HMIS)/Mother & Child Tracking System (MCTS)

5

Key points

- Supplementation of calcium to all pregnant women after the 1st trimester and continue till 6 months postpartum
- Calcium carbonate salts to be used
- Swallowable tablets of 500 mg elemental calcium and 250 IU Vitamin D3 in each tablet to be taken with meals twice a day
- IFA tablets to be taken at least 2 hours after meals

6

Records & registers

- Appropriate entries should be made in the ANC card of the pregnant woman about calcium supplementation
- A column should be added in the ANC register to record calcium supplementation given to pregnant women. This component should be made a part of regular monthly ANC reports sent by various levels
- Reporting on calcium supplementation during pregnancy should be made a part of reporting under the HMIS, MCTS Reproductive Child Health (RCH) portal

State and district programme managers to ensure

- Constant supply of calcium and its distribution
- Reflecting adequate budget in Programme Implementation Plan (PIP) and ensuring timely release of funds
- Monitoring outcome and progress

7

Monitoring and evaluation

- Monitoring of calcium supplementation during pregnancy should be made a part of the existing visits for monitoring ANC by various supervisors and should be included in their checklist
- ASHAs to monitor compliance through home visit
- ANM to monitor compliance during ANC and PNC

8

Outcome measures to be assessed

- Number/Percentage of ANC who have received calcium supplementation in the reporting month out of the total ANC
- Number/Percentage of PNC who have received calcium supplementation in the reporting month out of the total PNC
- Number/Percentage of PW having hypertensive disorder of pregnancy in the reporting month out of total deliveries



Budget

- Infrastructure: Any additional infrastructure not required
- Human resource: No separate human resource required
- Cost of calcium tablets can be reflected under Janani Shishu Suraksha Karyakram (JSSK)

Budget estimates and provision for calcium tablets needs to be done by the state/district programme officer

- a. It is estimated that each pregnant woman will take Tab. calcium after the 1st trimester. Every pregnant woman will be provided two calcium tablets daily.
- b. Calcium tablets will be given for six months during the ANC period and for six months during lactation. Thus, every woman will need 720 tablets. Each tablet will contain 500 mg elemental calcium and 250 IU Vitamin D3.
- c. So the budget provision needs to be made accordingly.

Training:

One day orientation/training can be organised. Stand-alone training is not required. This can be part of any other ongoing training or can be held during state/district/block review meetings

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Calcium rich foods



Annexure 1: Dietary Counselling for Calcium in Pregnancy and Lactation

Improve Calcium and Vit D uptake by



Drink one glass of milk everyday

Have one cup of curd everyday



Take morning sunlight everyday

Must take green leafy vegetables



Take one cup ragi everyday

Annexure 2: Counselling Tips

- Supplementation of calcium to all pregnant women after 1st trimester
- Calcium supplementation leads to maternal and fetal wellbeing
- Oral swallowable calcium tablets to be taken twice a day (total 1gm calcium/day) starting from 14 weeks of pregnancy up to 6 months post-partum.
- Calcium tablets should be taken, one with morning/afternoon meal and second with evening/night meal.
- Both calcium tablets are not to be taken together, it interferes with iron absorption.
- Calcium tablets should not be taken empty stomach since it causes gastritis.
- Calcium and IFA tablets should not be taken together since calcium inhibits iron absorption.
- IFA tablet should be taken preferably two hours after meal.



Two tablets of calcium per day keep the mother and child healthy!

Annexure 3: FAQs on Calcium Supplementation

Q 1. Why is it necessary to consume calcium?

Answer: Consumption of calcium is necessary for you and your child's health. It will help reduce the possibility of high blood pressure in pregnancy related complications. High blood pressure is dangerous for both mother and child. Calcium is also important for the growth of bones and teeth of your child.

Q 2. What should we eat to get calcium in our diet?

Answer: Calcium is found in abundance in:

- ♦ Milk and milk products such as cheese and curd.
- ♦ Green leafy vegetables such as spinach and fenugreek.
- ♦ Sweets made of sesame seeds and ragi.

Q 3. Do we still need to take calcium tablet?

Answer: A woman needs a lot of calcium during pregnancy, which she can't get from the food items she consumes. Therefore, it is necessary to supplement calcium tablet along with calcium rich food in pregnancy.

Q 4: When should we start consuming calcium and for what duration?

Answer: Two calcium tablets per day should be consumed from fourth month of pregnancy up to six months after delivery.

Q 5: What precautions should be taken while taking calcium tablet?

Answer: Calcium tablets should not be taken along with iron tablet. It should be taken with food ideally.

Annexure 4: Good Dietary Sources of Calcium

Food example	Amount	Calcium in milligrams
Milk	1 Cup	580
Butter Milk	1 Cup	232
Yogurt	1 Cup	452
Cheese	1 cubic inch	129
Ice-cream	1 Cup	272
Sweet Potatoes	1 Cup	50-100
Green Beans	1 Cup	50-100

1. Betrán AP, Wojdyla D, Posner SF, Gülmezoglu AM. National estimates for maternal mortality: an analysis based on the WHO systematic review of maternal mortality and morbidity. *BMC Public Health* 2005; 5:131.
2. Clark SL, Belfort MA, Dildy GA, Herbst MA, Meyers JA, Hankins GD. Maternal death in the 21st century: causes, prevention, and relationship to cesarean delivery. *American Journal of Obstetrics and Gynecology* 2008; 199(1):36.e1–e5.
3. Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet* 2006; 367:1066–74.
4. NHMRC. *NHMRC Report on Maternal Deaths in Australia 1988–1990*. Canberra: Government Publishing Service, 1993.
5. Langenveld J, Ravelli AC, vanKaam AH, van der Ham DP, van Pampus MG, Porath M, et al. Neonatal outcome of pregnancies complicated by hypertensive disorders between 34 and 37 weeks of gestation: a 7 year retrospective analysis of a national registry. *American Journal of Obstetrics and Gynecology* 2011; 205(6):540.e1–540.e7.
6. Ozkan H, Cetinkaya M, Koksall N, Ozmen A, Yildiz M. Maternal preeclampsia is associated with an increased risk of retinopathy of prematurity. *Journal of Perinatal Medicine* 2011; 39(5):523–7.
7. Villar J, Say L, Shennan A, Lindheimer M, Duley L, Conde Agudelo A, et al. Methodological and technical issues related to the diagnosis, screening, prevention and treatment of preeclampsia and eclampsia. *International Journal of Gynecology & Obstetrics* 2004; 85 (Suppl 1): S28–S41.

8. Chhabra S, Kakani A. Maternal mortality due to eclamptic and non-eclamptic hypertensive disorders: a challenge. *J Obstet Gynaecol.* 2007 Jan; 27 (1):25-9.
9. Villar J, Ezcurra EJ, Gurtner de la Fuente V, Campodonico L. Preterm delivery syndrome: the unmet need. *Research and Clinical Forums* 1994; 16:9-39.
10. Kazerooni T, Hamze-Nejadi S, Kazerooni T, Hamze-Nejadi S. Calcium to creatinine ratio in a spot sample of urine for early prediction of pre-eclampsia. *International Journal of Gynecology & Obstetrics* 2003; 80:279-83.
11. Kumru S, Aydin S, Simsek M, Sahin K, Yaman M, Ay G. Comparison of serum copper, zinc, calcium, and magnesium levels in pre-eclamptic and healthy pregnant women. *Biological Trace Element Research* 2003; 94:105-12.
12. Kisters K, Barenbrock M, Louwen F, Hausberg M, Rahn KH, Kosch M. Membrane, intracellular, and plasma magnesium and calcium concentrations in preeclampsia. *American Journal of Hypertension* 2000; 13:765-9.
13. Duvekot EJ, de Groot CJ, Bloemenkamp KW, Oei SG. Pregnant women with a low milk intake have an increased risk of developing preeclampsia. *European Journal of Obstetrics & Gynecology and Reproductive Biology* 2002; 105:11-4.
14. Belizan JM, Villar J, Repke J. The relationship between calcium intake and pregnancy-induced hypertension: up-to-date evidence. *American Journal of Obstetrics and Gynecology* 1988; 158:898-902.
15. Villar J, Belizan JM, Repke J. The effect of calcium supplementation on the incidence of hypertensive disorders of pregnancy and prematurity. 7th World Congress of Hypertension in Pregnancy; 1990; Perugia, Italy. 1990:54.

16. Villar J, Belizan JM, Repke JT. Does calcium supplementation reduce pregnancy-induced hypertension and prematurity? *Advances in the prevention of low birthweight*; 1988 May 8-11; Cape Cod, Massachusetts. 1998:187–95.
17. Villar J, Repke JT. Calcium supplementation during pregnancy may reduce preterm delivery in high-risk populations. *American Journal of Obstetrics and Gynecology* 1990; 163:1124–31.
18. Repke J, Villar J, Bergel E, Belizan JM. The effect of iron absorption in patients receiving calcium supplementation. 9th Annual Meeting of the Society of Perinatal Obstetricians; 1989 February 1-4; New Orleans, Louisiana, USA. 1989:512.
19. Hofmeyr GJ, Lawrie TA, Atallah ÁN, Duley L. Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems. *Cochrane Database of Systematic Reviews* 2010, Issue 8. Art. No.: CD001059. DOI: 10.1002/14651858.CD001059.pub3.
20. Hofmeyr GJ, Lawrie TA, Atallah ÁN, Duley L, Torloni MR. Calcium supplementation during pregnancy for preventing hypertensive disorders and related problems (Review). *Cochrane Database of Systematic Reviews* 2014, Issue 6.
21. National Nutrition Monitoring Bureau (NNMB) Survey, Rural-Third Repeat Survey 2011-12
22. V. Bhatia: Dietary calcium intake - a critical reappraisal: *Indian J Med Res* 127, March 2008, pp 269-273
23. World Health Organization Guideline: Calcium supplementation in pregnant women, 2013
24. Holick MF. Vitamin D deficiency. *N Engl J Med* 2007; 357:266–81.

25. National Institutes of Health, Office of Dietary Supplements. Vitamin D. Available at: <http://ods.od.nih.gov/factsheets/list-all/VitaminD>. Retrieved December 16, 2010.
26. Sachan A, Gupta R, Das V, Agarwal A, Awasthi PK, Bhatia V (2005). High prevalence of vitamin D deficiency among pregnant women and their newborns in northern India. *Am J Clin Nutr* 81, 1060–1064.
27. Sahu M, Bhatia V, Aggarwal A, Rawat V, Saxena P, Pandey A et al. (2008). Vitamin D deficiency in rural girls and pregnant women despite abundant sunshine in northern India. *Clin Endocrinol*, doi: 10.1111/j.1365-2265.2008.03360.
28. Vitamin D: screening and supplementation during pregnancy. Committee Opinion No. 495. American College of Obstetricians and Gynaecologists. *Obstet Gynecol* 2011; 118:197–8.
29. NICE Public Health Guidance 27 Dietary interventions and physical interventions for weight management before, during and after pregnancy. July 2010

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