**Supplemental digital content**

**Section A: *Search terms in Medline:***

“(((((((((prevalence) OR disease burden) OR estimate) OR trend)) AND (((((((((((((hypertension) OR blood pressure) OR raised blood pressure) OR elevated blood pressure) OR systolic blood pressure) OR diastolic blood pressure) OR SBP) OR DBP) OR isolated systolic blood pressure) OR high BP) OR BP) OR raised BP) OR elevated BP))) OR ((((((((risk factors) OR awareness) OR control) AND blood pressure)) OR ((((risk factors) OR awareness) OR control) AND hypertension))) AND (((((((((((((hypertension) OR blood pressure) OR raised blood pressure) OR elevated blood pressure) OR systolic blood pressure) OR diastolic blood pressure) OR SBP) OR DBP) OR isolated systolic blood pressure) OR high BP) OR BP) OR raised BP) OR elevated BP)))) AND (India))”.

Studies were included if they were:

1. Cross sectional, case control, and cohort studies.

2. Studies conducted among adult populations (≥ 18 years old).

3. Studies on prevalence, burden, risk factors, awareness, and control of blood pressure (BP) or hypertension (HTN)

4. Hypertension was defined as systolic blood pressure (SBP) more than or equal to 140 and or diastolic blood pressure (DBP) more than or equal to 90 mm of Hg

Articles were excluded if they were:

5. Letters, abstracts, conference proceedings, reviews and meta-analysis

6. Not conducted in humans

7. Not community based studies

**Section B: Freeman-Tukey transformation**

Freeman-Tukey variant of the arcsine square root transformed proportion (for the proportions from datasets that reported prevalence of hypertension) have been done to stabilise the variances. We used the below mentioned formulae:

*Transformation:*

gen x = asin(sqrt(`n\_hypertension'/(`n\_total'+1))) + asin(sqrt((`n\_hypertension'+1)/(`n\_total'+1)))

gen x\_se = sqrt(1/(`n\_total'+1))

*Back-Transformation:*

gen prop = 100\*sin(pooled\_x/2)^2

gen prop\_LCI = 100\*sin(pooled\_x\_LCI/2)^2

gen prop\_UCI = 100\*sin(pooled\_x\_UCI/2)^2

**Table S1: Prevalence of hypertension from community based published studies from India between 2011-2013**

| Author | Year | Place | n | Age in years | Place | Region | Overall % | % in male | % in female |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Pandey RM59 | 2013 | Four urban and five rural | 4624 (rural 2616, urban 2008) | 35-70 | India | India | NA | NA | urban 37.5 rural 29.3 |
| Ganguli D42 | 2013 | Urban | 415 | 40-85 | Kolkata | East India | 53.60 | NM | NM |
| Gupta R[57](#_ENREF_64) | 2013 | Urban | 6,106 | 35-70 | 11 cities of India | All India | NM | 32.50 | 30.40 |
| Joshi A21 | 2013 | Urban ; slum and tribal | urban - 222; slum - 100; tribal - 107 | 41.98 (14.39) | Bhubhaneshwar and Rourkela | East India | urban- 33.8  slum - 24.05 tribal -26.1 | NM | NM |
| Bhagyalaxmi[27](#_ENREF_30) | 2013 | Urban and rural | urban: 1,805; rural: 1,684 | 15-64 | Gujarat | West India | urban - 29; rural - 15.4 | NM | NM |
| Prince MJ[35](#_ENREF_38) | 2012 | One urban and one rural | 1000 urban and 1000 rural | >65 | Chennai - urban; Vellore - rural | South India | 60 - urban; 29 - rural | NM | NM |
| Gupta R60 | 2012 | Four urban and five rural | 1672 women | 35-70 | India | India | NA | NA | rural 31.5; urban 48.2 |
| Kaur P[34](#_ENREF_37) | 2012 | Rural | 10,463 | 25-64 | Tamil Nadu | South India | 21.40 | NM | NM |
| Kokiwar PR[30](#_ENREF_33) | 2012 | Rural | 924 | >30 | Karimnagar | South India | 19.04 | 14.40 | 23.40 |
| Borah PK[25](#_ENREF_25) | 2012 | Rural | 916 (male-465, female-451) | > 18 | Assam, Mizoram | East India | 55.60 | NM | NM |
| Chinnakali P[31](#_ENREF_34) | 2012 | Rural | 211 | 66 (6.9) | puducherry | South India | 40.5 | 39.2 | 40.8 |
| Dutta A[23](#_ENREF_26) | 2012 | Rural | 1186 women participants | >18 | West Bengal | East India | 24.70 | NM | NM |
| Kaur M[15](#_ENREF_17) | 2012 | Rural | urban- 300; rural - 300 | 40-70 | Haryana | North India | NA | NA | Rural - 9; urban - 26.66 |
| Haddad S[32](#_ENREF_35) | 2012 | Rural | 1660 | 18-96 | Kerala | South India | 23.5 | NM | NM |
| Bansal SK[1](#_ENREF_18)6 | 2012 | Rural | 968 | >18 yrs | Uttarakhand | North India | NM | 30.90 | 27.8 |
| Satish T[33](#_ENREF_36) | 2012 | Rural | 297 | 15-64 | Kerala | South India | 23.6 | NM | NM |
| Meshram[64](#_ENREF_71) | 2012 | Tribal | 4,193 adults (men: 1,891, women: 2,302) | >20 | Kerala | South India | 40 | NM | NM |
| Gupta R [43](#_ENREF_48) | 2012 | Urban | 739 subjects (men: 451, women 288) | 20-59 | Jaipur | West India | NM | 39.5 | 24.6 |
| Jeemon P[58](#_ENREF_65) | 2012 | Urban | 10396 | 20-69 | Ten sites in India - all India | All India | 28.7 | NM | NM |
| Joshi SR67 | 2012 | Urban | 15,662 | 48.9±13.9 | 8 states in India | All India | 46 | NM | NM |
| Samuel P65 | 2012 | Urban and rural | Urban - 997; rural -1221 | 26-32 | Vellore | South India | NM | urban: 4.9; rural: 2.1 | Urban: 1.3; rural: 1.5 |
| Biswas M[24](#_ENREF_27) | 2011 | Rural | NM | 20-70 | NadiaWest Bengal | East India | 19.28 | 19.26 | 16.66 |
| Singh RB[39](#_ENREF_43) | 2011 | Urban | 3507 men; 3433 women | >25 yrs | 5 cities in India | All India | NM | S.I:35.5  W.I:35.6; N.I: 27;  E.I: 24 | S.I: 31.9; W.I:29.1; N.I:24.5  E.I: 22.4 |

Note: S.I – South India; W.I: West India; N.I: North India; E.I: East India

**Table S2: Awareness, treatment and control of BP among Indian hypertensives**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Author** | **Year** | **sample size** | **Region** | **% Aware** | **% Treated** | **% BP Control** | **Place** |
| Joshi A[21](#_ENREF_23) | 2013 | 107 | East India | 24.3 | 41.7 | 14 | Tribal |
| Gupta R [57](#_ENREF_64) | 2013 | 6106 | All India | 44.7 | 36.5 | 28.2 | Urban |
| Joshi A[21](#_ENREF_23) | 2013 | 222 | East India | 65.5 | 80 | 10 | Urban |
| Gupta R[60](#_ENREF_67) | 2012 | 2604 | India | 24.6 | 46.5 | 10.2 | Rural |
| Kaur P[34](#_ENREF_37) | 2012 | 10,463 | South India | NM | 20 | 6.6 | Rural |
| Prince MJ[35](#_ENREF_38) | 2012 | 1000 | South India | 43 | NM | 9 | Rural |
| Prince MJ[35](#_ENREF_38) | 2012 | 1000 | South India | 44 | NM | 12 | Urban |
| Gupta R[60](#_ENREF_67) | 2012 | 2004 | India | 56.8 | 35.7 | 28.3 | Urban |
| Manimunda[36](#_ENREF_39) | 2011 | 975 | Car Nicobar islands | 12 | 0.01 | 0.01 | Rural |
| Bhardwaj17 | 2010 | 1092 | North India | 21.9 | 47 | 20.2 | Rural |
| Jonas[72](#_ENREF_75) | 2010 | 4711 | Central India | 20 | 8 | NM | Rural |
| Thankappan[51](#_ENREF_57) | 2010 | 7449 | South India | 36.9 | 26.9 | 8.6 | Urban |
| Yadav[73](#_ENREF_76) | 2008 | 294 | North India | 50 | 39 | 14.6 | Urban |
| Chaturvedi[41](#_ENREF_45) | 2007 | 1213 | North India | 54 | 42 | 10.5 | Urban |
| Thankappan[8](#_ENREF_11) | 2006 | 4955 | South India | 45 | NM | 10 | Rural |
| Hazarika[26](#_ENREF_29) | 2004 | 3180 | East India | 21.6 | 21.4 | 18.1 | Rural |
| Bharucha[49](#_ENREF_55) | 2003 | 2415 | West India | 51.5 | NM | 13.6 | Urban |
| Deepa[54](#_ENREF_61) | 2003 | 1262 | South India | 37.3 | 18.7 | 7.5 | Urban |
| Thakur K[74](#_ENREF_77) | 1999 | 1727 | North India | 87.50 | 16.7 | 16.7 | Peri-Urban |
| Kaur P[34](#_ENREF_37) | 2012 | 10463 | South India | 21.4 | 20 | 6.60 | Rural |
| Yuvaraj BY[78](#_ENREF_78) | 2010 | 1900 | South India | 33.80 | 32.10 | 12.50 | Rural |
| Thankappan KR[8](#_ENREF_11) | 2006 | 4955 | South India | 24 | 20 | 6.4 | Rural |
| Hazarika NC[75](#_ENREF_79) | 2004 | 3180 | East India | 21.60 | NM | NM | Rural |
| Kaur M[15](#_ENREF_17) | 2012 | 600 | North India | 37 in rural and 72 urban | NM | NM | Rural and Urban |
| Gupta R[60](#_ENREF_67) | 2012 | 4608 | All India | 42.80 | 38.60 | 21.50 | Rural and Urban |
| Hazarika NC[26](#_ENREF_29) | 2003 | 888 | East India | 26.90 | NM | NM | Rural and Urban |
| Meshram II[64](#_ENREF_71) | 2012 | 4193 | South India | 10 | 8 | NM | tribal |
| Singh RB[39](#_ENREF_43) | 2011 | 6940 | All India | 20 | 47 | 33.3 | Urban |
| Vimala A[76](#_ENREF_80) | 2009 | 482 | South India | 16.8 | 9.34 | NM | Urban |
| Yadav G73 | 2008 | 294 | North India | 50 | 39 | 14.60 | Urban |
| Mohan V[52](#_ENREF_58) | 2007 | 26,001 | South India | 32.80 | 70.80 | 45.90 | Urban |
| Chaturvedi S[41](#_ENREF_45) | 2007 | 1213 | North India | 54 | 43.40 | 8.50 | Urban |
| Prabhakaran D[77](#_ENREF_46) | 2005 | 2935 | North India | 31.50 | NM | 38 | Urban |
| Zachariah MG[78](#_ENREF_82) | 2003 | 314 | South India | 39 | 29 | 30.60 | Urban |
| Bharucha NE[55](#_ENREF_55) | 2003 | 2879 | Central India | 51.5 | 63.60 | 13.60 | Urban |
| Gupta AK79 | 1998 | 7630 | North India | 22.05 | NM | NM | Urban |
| Chadha SL[80](#_ENREF_84) | 1990 | 13,723 | North India | 50% | 30% | 9% | Urban |
| Kalavathy[81](#_ENREF_85) | 2000 | 84 | South India | 34.9 | 31.7 | 7 | Rural |
| Kalavathy[81](#_ENREF_85) | 2000 | 133 | South India | 53.8 | 52.6 | 13 | Urban |

**Table S3: Risk factors for hypertension reported from Indian studies**

|  |  |  |
| --- | --- | --- |
| **Author** | **Risk factor** | **Magnitude of effect size - OR/RR: estimate (95% CI)** |
| Borah PK[25](#_ENREF_28) | **Age : >60 years** | 2.9 (1.88-4.43) |
| Mohan[52](#_ENREF_58) | Age : >60 years | 13.45 (8.07 – 20.78) |
| Manimunda[36](#_ENREF_39) | Age : >60 years | 6.83 (4.30-10.86) |
| Dutta[23](#_ENREF_26) | Age : >60 years | 11.09 (6.56 – 18.74) |
| Hazarika[63](#_ENREF_70) | Age : >60 years | 9.29 (5.27 – 16.37) |
| Borah PK[25](#_ENREF_28) | **Age: 50-59 years** | 2.6 (1.72-4) |
| Manimunda[36](#_ENREF_39) | Age: 50-59 years | 5.49 (3.56 – 8.48) |
| Dutta[23](#_ENREF_26) | Age: 50-59 years | 7.18 (4.31-11.95) |
| Hazarika[63](#_ENREF_70) | Age: 50-59 years | 2.99 (2-4.46) |
| Manimunda[36](#_ENREF_39) | **Age: 40-49 years** | 3.73 (2.48 – 5.60) |
| Dutta[23](#_ENREF_26) | Age: 40-49 years | 5.73 (3.60 – 9.10) |
| Hazarika[[63](#_ENREF_70)](#_ENREF_70) | Age: 40-49 years | 1.72 (1.27 – 2.33) |
| Sathish T[33](#_ENREF_36) | **Age: ≥35 years** | 4.00 ( 2.37-6.03) |
| Borah PK[25](#_ENREF_28) | **Alcohol** | 3.9 (2.84 - 5.49) |
| Meshram[64](#_ENREF_71) | Alcohol | 1.4 (1.17-1.73) |
| Manimunda[36](#_ENREF_39) | Alcohol | 1.35 (1.02-1.78) |
| Hazarika[63](#_ENREF_70) | Alcohol | 2.49 (1.66 – 3.74) |
| Sathish T[33](#_ENREF_36) | **Smoking** | 1.99 (1.14-2.97) |
| Mohan[52](#_ENREF_58) | Smoking | 1.50 (1.18 – 1.91) |
| Sathish T[33](#_ENREF_36) | **Central obesity** | 2.45 (1.45-3.70) |
| Ganguli D[42](#_ENREF_47) | Central obesity | 2.55 (1.07-6.06) |
| Thankappan[8](#_ENREF_11) | Central obesity | 1.84 (1.55-2.19) |
| Mohan[52](#_ENREF_58) | Central obesity | 2.17 (1.76 - 2.69) |
| Gupta[57](#_ENREF_64) | Central obesity | 3.40 (2.39 – 4.83) males  1.70 (1.33 – 2.17) females |
| Ganguli D[42](#_ENREF_47) | **Apo B** | 2.57 (1- 6.61) |
| Shanthirani[53](#_ENREF_60) | **BMI≥25** | 1.12 – 4.10 |
| Manimunda [36](#_ENREF_39) | BMI≥25 | 2.86 (2.05 – 4) |
| Mohan[52](#_ENREF_58) | BMI≥25 | 2.37 (1.87-2.99) |
| Dutta[23](#_ENREF_26) | BMI≥25 | 3.94 (2.65 – 5.86) |
| Thankappan[8](#_ENREF_11) | BMI≥25 | 1.65 (1.37-1.98) |
| Gupta[57](#_ENREF_64) | BMI≥25 | 3.44 (2.80 – 4.23) males  1.70 (1.33 – 2.17) females |
| Mohan[52](#_ENREF_58) | **Hypercholesterolemia** | 2.08 (1.68 – 2.58) |
| Mohan[52](#_ENREF_58) | **Hypertriglyceridemia** | 2.18 (1.75 – 2.7) |
| Dutta[23](#_ENREF_26) | **Biomass** | 1.51 (1.14 – 1.70) |
| Gupta[57](#_ENREF_64) | **High dietary fat** | 1.85 (1.48 – 2.31) males |
| Gupta[57](#_ENREF_64) | **Low fruits/vegetables** | 1.67 (1.31 – 2.14) males  1.84 (1.44 – 2.34) females |
| Borah PK [28](#_ENREF_28) | **Diabetes** | 3.2 (2.23-4.26) |
| Gupta[57](#_ENREF_64) | Diabetes | 3.08 (2.36 – 4.02) males  4.42 (3.22 – 6.06) females |
| Gupta[57](#_ENREF_64) | **Metabolic syndrome** | 7.09 (5.06 – 9.92) males  6.26 (4.77 – 8.20) females |
| Hazarika[63](#_ENREF_70) | **Khaini chewing** | 1.78 (1.25 – 2.55) |
| Hazarika[63](#_ENREF_70) | **Chewing tobacco** | 1.88 (1.27 – 2.79) |
| Hazarika[63](#_ENREF_70) | **Extra salt (1/4 to ½ tea spoonful)** | 1.97 (1.47 – 2.65) |
| Hazarika[63](#_ENREF_70) | **Waist hip ratio >0.88** | 2.24 (1.22 – 4.12) |
| Meshram[64](#_ENREF_71) | **Sedentary activity** | 1.3 (1.09-1.60) |

**(C) Pooled prevalence of hypertension using population size weights (figures S1 to S4)**

**Figure S1: Prevalence of hypertension in rural and urban parts of N. India**



**Figure S2: Prevalence of hypertension in rural and urban parts of E. India**



**Figure S3: Prevalence of hypertension in rural and urban parts of W. India**



**Figure S4: Prevalence of hypertension in rural and urban parts of S. India**



**(D) Pooled prevalence of hypertension using random effects model, without adjusting for population size (figures S5 to S8)**

**Figure S5: Prevalence of hypertension in rural and urban parts of N. India**



**Figure S6: Prevalence of hypertension in rural and urban parts of E. India**



**Figure S7: Prevalence of hypertension in rural and urban parts of W. India**



**Figure S8: Prevalence of hypertension in rural and urban parts of S. India**



**Figure S9: Proportion of awareness of hypertension in rural and urban areas (All India)**



**Figure S10: Proportion treated for hypertension in rural and urban areas (All India)**



**Figure S11: Proportion having hypertension under control in rural and urban areas (All India)**



**Figure S12: Metafunnel plot for Indian studies on prevalence of hypertension**



**(D) Metareg analysis, where 0 = rural and 1 = urban**

**North India**



**East India**



**West India**



**South India**



**(E) References from 72-83**

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77. Prabhakaran, D., et al., *Cardiovascular risk factor prevalence among men in a large industry of northern India.* Natl Med J India, 2005. **18**(2): p. 59-65.

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81. Kalavathy, M.C., et al., *Prevalence, awareness, treatment and control of hypertension in an elderly community-based sample in Kerala, India.* Natl Med J India, 2000. **13**(1): p. 9-15.

**Reporting Checklist for Meta-analyses of Observational Studies (MOOSE)**

|  |  |  |
| --- | --- | --- |
|  | Reported? | Page number |
| Reporting of background should include: |  |  |
| Problem definition | Yes | 3-4 |
| Hypothesis statement | Yes | 4 |
| Description of study outcome(s) | Yes | 4,5 |
| Type of exposure or intervention used | Yes | 4,5 |
| Type of study designs used | Yes | 5 |
| Study population | Yes | 5 |
| Reporting of search strategy should include: |  |  |
| Qualifications of searchers (eg, librarians and investigators) | Yes | 1 |
| Search strategy, including time period included in the synthesis and keywords | Yes | 5 |
| Effort to include all available studies, including contact with authors | Yes | 5 |
| Databases and registries searched | Yes | 5 |
| Search software used, name and version, including special features used (eg, explosion) | No | 5 |
| Use of hand searching (eg, reference lists of obtained articles) | Yes | 6 |
| List of citations located and those excluded, including justification | Yes | 5,6 |
| Method of addressing articles published in languages other than English | Yes | N/A |
| Method of handling abstracts and unpublished studies | No | 5,6 |
| Description of any contact with authors | Yes | 6 |
| Reporting of methods should include: |  |  |
| Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested | Yes | 6 |
| Rationale for the selection and coding of data (eg, sound clinical principles or convenience) | Yes | 7,8 |
| Documentation of how data were classified and coded (eg, multiple raters, blinding, and interrater reliability) | Yes | 8 |
| Assessment of confounding (eg, comparability of cases and controls in studies where appropriate) | No | 8 |
| Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results | Yes | 9 |
| Assessment of heterogeneity | Yes | 7, 9-11 |
| Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated | Yes | 7 and SDC |
| Provision of appropriate tables and graphics | Yes | 9, 23-25, TableS1 to S3 in SDC |
| Reporting of results should include: |  |  |
| Graphic summarizing individual study estimates and overall estimate | Yes | 23-25, Fig 2&3; fig S1 to S8 in SDC |
| Table giving descriptive information for each study included | Yes | SDC |
| Results of sensitivity testing ( eg, subgroup analysis) | Yes | SDC |
| Indication of statistical uncertainty of findings | Yes | 9-11 |
| Reporting of discussion should include: |  |  |
| Quantitative assessment of bias (eg, publication bias) | Yes | 16, figure S12 in SDC |
| Justification of exclusion (eg, exclusion of non-English-language citations) | Yes | 7 |
| Assessment of quality of included studies | Yes | 9, 16 |
| Reporting of conclusions should include: |  |  |
| Consideration of alternative explanations for observed results | Yes | 13,16 |
| Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review) | Yes | 16-17 |
| Guidelines for future research | Yes | 17 |
| Disclosure of funding source | Yes | 17 |

**Note:** SDC – supplemental digital content

*Reference:*

* Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D, Moher D, Becker BJ, Sipe TA, Thacker SB. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. JAMA 2000; 283(15):2008-2012.