SUPPLEMENTARY MATERIAL

Prevalence of tobacco consumption among pulmonary tuberculosis patients and its correlation with tuberculosis incidence: a systematic review and meta-analysis in the Indian context

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Key words: tuberculosis, tobacco consumption, pulmonary tuberculosis, smokeless tobacco, systematic review and meta-analysis.

Database	No	Search Query	Results
PubMed			
	#1	"Tuberculosis"[Title/Abstract] OR "TB"[Title/Abstract]	272,308
	#2	"Tobacco"[Title/Abstract] OR "SLTS"[Title/Abstract] OR "Smoking"[Title/Abstract]	360,748
	#3	"india"[MeSH Terms] OR "india"[All Fields] OR "indias"[All Fields] OR "indias"[All Fields]	858,713
	#4	#1 AND #2 AND #3	323
Embase			
	#1	'tuberculosis':ti,ab OR 'tb':ti,ab	299,884
	#2	'tobacco':ti,ab OR 'slts':ti,ab OR 'smoking':ti,ab	508,603
	#3	'india'/exp OR 'india':ti,ab,kw OR 'indias':ti,ab,kw	275,261
	#4	#1 AND #2 AND #3	371
Web of Sc	cience		
	#1	TS=("Tuberculosis" OR "TB")	<u>227,897</u>
	#2	TS=("Tobacco" OR "SLTS" OR "Smoking")	<u>393,983</u>
	#3	TS=("India" OR "Indias")	236,065
	#4	#1 AND #2 AND #3	<u>171</u>
Scopus			
	#1	(TITLE-ABS ("Tuberculosis") OR TITLE-ABS ("TB"))	331,916
	#2	(TITLE-ABS ("Tobacco") OR TITLE- ABS ("SLTS") OR TITLE-ABS ("Smoking"))	444,600
	#3	(TITLE-ABS-KEY ("India") OR TITLE-ABS- KEY ("Indias"))	637,423
	#4	#1 AND #2 AND #3	247

Supplementary Table 1. Search strategy (30/09/24).

Supplementary Table 2. Characteristics of the study.

SI no	Author (last		Zone	Type of study		Status of	Number	Number of	Comparator
	name <i>et al</i> .)	study		(survey/ cross-	patients	tuberculosis	of cases	cases who	group
				sectional		(completed	who are	are using	
				study/ case		treatment/ under	smoking	smokeless	
				control/		treatment/ treatment		tobacco	
				cohort)		not started)			
1	Aggarwal <i>et</i>	2022	Central	Cross-	420	under treatment	153	160	
-	al. [8]	2225	India	sectional study	0.4 -				
2	AS P <i>et al.</i> [9]	2006-	South	Cross-	215	Completed	41	23	
-		2007	India	sectional study	110	treatment	~ -	6.0	
3	Marak <i>et al.</i>	2013-14	North	Cross-	110	Under Treatment	37	68	Present
	[10]		East India	sectional study					
4	Thomas <i>et al.</i>	2015-20	Pan	Cross-	199	Treatment not	21		
4	[11]	2015-20	India	sectional study	199	Started before Dx	21		
5	Chowdhury R	2019	North	Cross-	447	Under treatment or	37		
5	<i>et al.</i> [12]	2019	India	sectional study	447	already treated	57		
6	Rathee <i>et al.</i>	2010-11	North	Cross-	101	Under treatment	42		
U	[13]	2010 11	India	sectional study	101	onder treatment	-12		
7	Deepak <i>et al.</i>	2007	South	Cross-	202	completed	33	60	
-	[14]	2007	India	sectional study	202	treatment	55	00	
8	Dolla <i>et al.</i>	2015	South	Cross-	192	Treatment not	75		
	[15]		India	sectional study		Started before Dx			
9	Gupta RK et		North	Cross-	25	under treatment	13		Present
	<i>al.</i> [16]		India	sectional study					
10	Gupte et al.	2015-	West	Cross-	1304	under treatment and	38	212	
	[17]	2017	India	sectional study		completed			
				-		treatment			
11	Gupta <i>et al.</i>	2019	North	Cross-	197	under treatment	43	5	
	[18]		India	sectional study					
12	Gambhir <i>et al.</i>	2009	North	Case-Control	55	Not Available	37		Present
	[19]		India	study					

13	Jali <i>et al.</i> [20]	2012	South	Cross-	264	Not Available	36		
			India	sectional study					
14	Kanakia <i>et al</i> .	2014	South	Cross-	78	Unclear	63		
	[21]		India	sectional study					
15	Kumar <i>et al.</i>	2018	North	Cross-	211	Newly Diagnosed	29	23	
	[22]		India	sectional study		, 0			
16	Prasad et al.	2004	North	Case-Control	111	Not Mentioned	37	24	Present
	[23]		India	study					
17	Bagchi <i>et al.</i>	2003	West	Cross-	538	Under treatment	15		
	[24]		India	sectional study					
18	Das <i>et al.</i> [25]	2011-12	East	Cross-	374	Under treatment	227		
			India	sectional study					
19	Saad et al.	2011-12	Central	Case-Control	613	Under treatment	277		Present
	[26]		India	study					
20	Sumana <i>et al.</i>	2019-20	South	Cohort study	300	Under treatment	62	33	
	[27]		India	/					
21	Thomas <i>et al.</i>	2014	South	Cohort study	455	Under treatment	94		
	[28]	onwards	India	/					
22	Mahishale et	2012-13	South	Cohort study	2350	Under treatment	49		
	al. [29]		India	/					
23	Mariappan et	2013-14	South	Cross-	235	Under treatment	55	23	
	<i>al.</i> [30]		India	sectional study					
24	Rao <i>et al.</i> [31]	2009-10	Central	Cross-	221	Not started Rx	82		Present
			India	sectional study					
25	Rao <i>et al.</i> [32]	2009-10	Central	Cross-	23	Not started Rx	11		Present
			India	sectional study					
26	Rao <i>et al.</i> [33]	2013-14	Central	Case-Control	220	Not started Rx	128		Present
			India	study					
27	Bhat <i>et al.</i> [34]	2007-08	Central	Cross-	133	Not started Rx	64		Present
		2007 00	India	sectional study					resent

Supplementary Table 3. Risk of bias assessment.

C	Author	Was the	Mara study	Mar the	Ware the	Was the	Were valid	Was the	M/ac there	Was the	
SI	Author		Were study		Were the				Was there		
no	(Last name	sample	participants		study	data	methods	condition	appropriate	response rate	
	et al.)	frame	sampled in	size	subjects	analysis	used for the	measured in	statistical	adequate, and	
		appropriate	an	adequate?	and the	conducted	identification	a standard,	analysis?	if not, was the	
		to address	appropriate	-	setting	with	of the	reliable way	-	low response	
		the target	way?		described	sufficient	condition?	for all		rate managed	
		population?	,		in detail?	coverage		participants?		appropriately?	
						of the		· ·			
						identified					
						sample?					
1	Aggarwal <i>et</i>	Yes	No	Yes	No	Yes	No	No	Yes	Yes	5
-	al.										5
2	AS et al.	No	Yes	Yes	No	Yes	No	Yes	Yes	Yes	6
3	Marak <i>et al</i> .	No	Unclear	Yes	No	Yes	No	Yes	Yes	Yes	5
4	Thomas et	Yes	Yes	Yes	Yes	Yes	Unclear	No	Yes	Yes	7
	al.										
5	Chowdhury	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	8
	et al.										
6	Rathee <i>et</i>	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	7
	al.										
7	Deepak <i>et</i>	No	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	7
	al.										
8	Dolla <i>et al.</i>	Yes	No	Yes	No	Yes	Yes	Yes	Yes	Yes	7
9	Gupta RK	Yes	No	No	Yes	Yes	Yes	Yes	Yes	Yes	7
10	Gupte <i>et al.</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
11	Gupta <i>et al.</i>	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	7
13	Jali <i>et al.</i>	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Unclear	7
14	Kanakia <i>et</i>	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Not	6
	al.									Applicable	
15	Kumar <i>et</i>	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Unclear	6
	al.										

17	Bagchi <i>et</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
	al.										
18	Das <i>et al</i> .	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
20	Sumana et	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
	al.										
21	Thomas <i>et</i> al.	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
22	Mahishale <i>et al.</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
23	Mariappan <i>et al.</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
24	Rao <i>et al.</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
25	Rao <i>et al.</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
27	Rao <i>et al.</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
Cas	e-control stud	ly									
12	Gambhir et	1	Unclear	1	1	1	1	1	1	Unclear	
	al.										
16	Prasad et	1	1	Unclear	No	No	1	1	1	Unclear	
	al.										
19	Saad <i>et al.</i>	1	1	1	1	1	1	1	1	1	
26	Rao <i>et al.</i>	1	1	1	1	1	1	No	1	1	

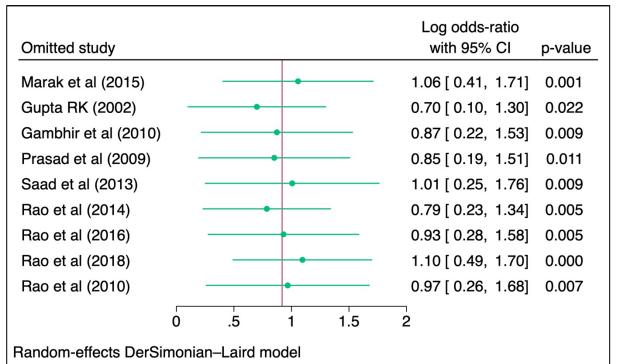
Omitted study	Proportion with 95% C	
Aggarwal et al (2023)	0.30 [0.25, 0	0.36] 0.000
AS P et al (2008)	• 0.31 [0.26, 0	0.37] 0.000
Marak et al (2015)	0.31 [0.25, 0	0.36] 0.000
Thomas et al (2021)	• 0.31 [0.26, 0	0.37] 0.000
Chowdhury R et al (2020)	• 0.32 [0.26, 0	0.37] 0.000
Rathee et al (2016)	• 0.30 [0.25, 0	0.36] 0.000
Deepak et al (2012)	• 0.31 [0.26, 0	0.37] 0.000
Dolla et al (2021)	• 0.30 [0.25, 0	0.36] 0.000
Gupta RK (2002)	• 0.30 [0.25, 0	0.35] 0.000
Gupte et al (2018)	• 0.32 [0.25, 0	0.000 [0.000
Gupta et al (2022)	• 0.31 [0.26, 0	0.36] 0.000
Gambhir et al (2010)	0.29 [0.24, 0	0.35] 0.000
Jali et al (2013)	• 0.31 [0.26, 0	0.37] 0.000
Kanakia et al (2016)	• 0.29 [0.24, 0	0.34] 0.000
Kumar et al (2020)	• 0.31 [0.26, 0	0.37] 0.000
Prasad et al (2009)	0.31 [0.25, 0	0.36] 0.000
Bagchi et al (2010)	• 0.32 [0.26, 0	0.38] 0.000
Das et al (2017)	0.29 [0.24, 0	0.34] 0.000
Saad et al (2013)	• 0.30 [0.25, 0	0.35] 0.000
Sumana et al (2024)	• 0.31 [0.26, 0	0.36] 0.000
Thomas et al (2019)	• 0.31 [0.26, 0	0.36] 0.000
Mahishale et al (2015)	• 0.32 [0.25, 0	0.39] 0.000
Mariappan et al (2016)	• 0.31 [0.26, 0	0.36] 0.000
Rao et al (2014)	0.30 [0.25, 0	0.36] 0.000
Rao et al (2016)	0.30 [0.25, 0	0.36] 0.000
Rao et al (2018)	0.29 [0.24, 0	0.35] 0.000
Rao et al (2010)	0.30 [0.25, 0	0.35] 0.000
	.25 .3 .35 .4	

Random-effects DerSimonian-Laird model

Supplementary Figure 1. Leave-one-out sensitivity analysis for smoking prevalence among pulmonary tuberculosis patients.

Omitted study					Proportion with 95% CI	p-value
Aggarwal et al (2023)	_	•			0.17 [0.11, 0.23]	0.000
AS P et al (2008)			•		0.20 [0.13, 0.27]	0.000
Marak et al (2015)		•			0.15 [0.09, 0.21]	0.000
Deepak et al (2012)	-	•			0.18 [0.11, 0.25]	0.000
Gupte et al (2018)			•		0.20 [0.12, 0.27]	0.000
Gupta et al (2022)					0.21 [0.14, 0.28]	0.000
Kumar et al (2020)			•		0.20 [0.13, 0.27]	0.000
Prasad et al (2009)					0.19 [0.12, 0.26]	0.000
Bagchi et al (2010)			•		0.21 [0.13, 0.28]	0.000
Sumana et al (2024)			•		0.20 [0.13, 0.27]	0.000
Mariappan et al (2016)			•		0.20 [0.13, 0.27]	0.000
	.1	.15	.2	.25	.3	
Random-effects DerSimo	nian-	-Laird mode	I			

Supplementary Figure 2. Leave-one-out sensitivity analysis for smokeless tobacco users among pulmonary tuberculosis patients.



Supplementary Figure 3. Leave one out sensitivity analysis for association of tobacco smoking with pulmonary tuberculosis.

Author (Year of Publication)	Number of Current Smokers	Number of Pulmonary TB Patients		Proportion with 95% CI	Weigl (%)
After treatment completion					
AS P et al	67	215	-	0.31 [0.25, 0.37]	3.27
Deepak et al	46	202	-	0.23 [0.17, 0.29]	3.30
Mahishale et al	56	2,350		0.02 [0.02, 0.03]	3.52
Heterogeneity: $\tau^2 = 0.03$, $I^2 = 9$	8.44%, H ² = 64.06			0.19[-0.01, 0.38]	
Test of $\theta_i = \theta_i$: Q(2) = 128.12, p	o = 0.00				
Test of $\theta = 0$: $z = 1.85$, $p = 0.00$	6				
Not started on Treatment					
AS P et al	153	215		0.71 [0.65, 0.77]	3.28
Thomas et al	21	199		0.11 [0.06, 0.15]	3.40
Deepak et al	103	202		0.51 [0.44, 0.58]	3.21
Dolla et al	75	192	-	0.39 [0.32, 0.46]	3.21
Kanakia et al	63	78	-	0.81 [0.72, 0.90]	3.05
Kumar et al	29	211	-	0.14 [0.09, 0.18]	3.38
Mahishale et al	292	2,350		0.12[0.11, 0.14]	3.51
Rao et al	82	221	-	0.37 [0.31, 0.43]	3.26
Rao et al	11	23		0.48 [0.27, 0.68]	1.90
Rao et al	128	220	-	0.58 [0.52, 0.65]	3.24
Rao et al	64	133		0.48 [0.40, 0.57]	3.07
Heterogeneity: $\tau^2 = 0.06$, $I^2 = 9$	8.92%, H ² = 92.51		-	0.42 [0.28, 0.57]	
First of $\theta_i = \theta_j$: Q(10) = 925.10,	p = 0.00				
Test of $\theta = 0$: $z = 5.76$, $p = 0.00$	0				
Jnder Treatment					
Aggarwal et al	153	420	-	0.36 [0.32, 0.41]	3.38
AS P et al	41	215	-	0.19 [0.14, 0.24]	3.34
Marak et al	37	110		0.34 [0.25, 0.42]	3.04
Chowdhury R et al	37	447		0.08 [0.06, 0.11]	3.48
Rathee et al	42	101		0.42 [0.32, 0.51]	2.97
Deepak et al	19	202		0.09 [0.05, 0.13]	3.41
Gupta RK	13	25		0.52 [0.32, 0.72]	1.98
Gupte et al	38	1,304		0.03 [0.02, 0.04]	3.52
Gupta et al	43	197	-	0.22 [0.16, 0.28]	3.30
Prasad et al	37	111		0.33 [0.25, 0.42]	3.05
Bagchi et al	15	538		0.03 [0.01, 0.04]	3.51
Das et al	227	374	-	0.61 [0.56, 0.66]	3.36
Saad et al	277	613		0.45 [0.41, 0.49]	3.42
Sumana et al	62	300		0.21 [0.16, 0.25]	3.38
Thomas et al	94	455		0.21 [0.17, 0.24]	3.43
Mahishale et al	49	2,350		0.02 [0.02, 0.03]	3.52
Mariappan et al	55	235	-	0.23 [0.18, 0.29]	3.33
Heterogeneity: $\tau^2 = 0.01$, $I^2 = 9$	8.99%, H ² = 98.71		•	0.24 [0.19, 0.30]	
Test of $\theta_i = \theta_j$: Q(16) = 1579.41	1, p = 0.00				
Test of $\theta = 0$: $z = 8.74$, $p = 0.00$	0				
Overall			•	0.30 [0.26, 0.34]	
Heterogeneity: $\tau^2 = 0.01$, $I^2 = 9$	9.11%, H ² = 111.94				
Test of $\theta_1 = \theta_1$: Q(30) = 3358.20					
Test of $\theta = 0$: $z = 14.07$, $p = 0.0$					
Test of group differences: Q _b (2	e) = 5.86, p = 0.05				
			0.5	1	
andom-effects DerSimonian-L	_aird model				

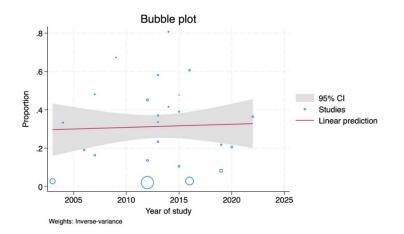
Random-effects DerSimonian-Laird model Supplementary Figure 4. Smoking prevalence among pulmonary tuberculosis patients stratified by treatment stage.

Author (Year of Publication)	Number of SLT users	Number of Pulmonary TB patient	s				Proportion with 95% CI	Weight (%)
After treatment completion								
AS P et al	32	215	-	-			0.15 [0.10, 0.20]	7.20
Deepak et al	54	202			_		0.27 [0.21, 0.33]	7.01
Heterogeneity: $\tau^2 = 0.01$, $I^2 = 3$	88.90%, H ² = 9	0.01	-		•		0.21 [0.09, 0.32]	
Test of $\theta_i = \theta_i$: Q(1) = 9.01, p =								
Test of $\theta = 0$: z = 3.49, p = 0.0								
Not started on Treatment								
AS P et al	56	215		-	-		0.26 [0.20, 0.32]	7.05
Deepak et al	88	202			-		0.44 [0.37, 0.50]	6.89
Kumar et al	23	211	-	ŀ			0.11 [0.07, 0.15]	7.27
Heterogeneity: $\tau^2 = 0.03$, $I^2 = 2$	97.00%, H ² = 3	3.36	-				0.27 [0.08, 0.45]	
Test of $\theta_i = \theta_j$: Q(2) = 66.71, p	0 = 0.00							
Test of θ = 0: z = 2.82, p = 0.0	00							
Under Treatment								
Aggarwal et al	160	420			-		0.38 [0.33, 0.43]	7.22
AS P et al	23	215	-	F.			0.11 [0.07, 0.15]	7.28
Marak et al	68	110					0.62 [0.53, 0.71]	6.48
Deepak et al	17	202		-			0.08 [0.05, 0.12]	7.31
Gupte et al	212	1,304					0.16 [0.14, 0.18]	7.46
Gupta et al	5	197					0.03 [0.00, 0.05]	7.45
Prasad et al	24	111					0.22 [0.14, 0.29]	6.75
Sumana et al	33	300					0.11 [0.07, 0.15]	7.34
Mariappan et al	23	235	-	ł.			0.10 [0.06, 0.14]	7.31
Heterogeneity: $\tau^2 = 0.01$, $I^2 = 2$	97.62%, H ² = 4	1.96					0.19 [0.12, 0.27]	
Test of $\theta_i = \theta_j$: Q(8) = 335.72,	p = 0.00							
Test of θ = 0: z = 4.96, p = 0.0	00							
Overall				•			0.21 [0.15, 0.27]	
Heterogeneity: $\tau^2 = 0.01$, $I^2 = 2$	97.10%, H ² = 3	4.48						
Test of $\theta_i = \theta_i$: Q(13) = 448.30	, p = 0.00							
Test of $\theta = 0$: z = 6.67, p = 0.0	00							
Test of group differences: $Q_b(x)$	2) = 0.51, p = 0	0.78	·					
			0	.2	.4	.6	.8	
Random-effects DerSimonian-	Laird model							

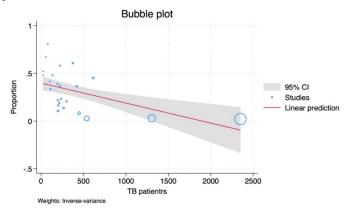
Supplementary Figure 5. Smokeless tobacco use prevalence among pulmonary tuberculosis patients stratified by treatment stage.

Author (Year of Publication)	Number of Smokers	Number of PTB Patients			Proportion with 95% CI	Weigh (%)
Female						
Chowdhury et al (2020)	7	127	-		0.06 [0.02, 0.09]	8.35
Saad et al (2013)	2	155			0.01 [0.00, 0.03]	8.44
Thomas et al (2019)	1	160			0.01 [0.00, 0.02]	8.45
Mahishale et al (2015)	6	592			0.01 [0.00, 0.02]	8.46
Mariappan et al (2016)	1	48	-		0.02 [0.00, 0.06]	8.35
Heterogeneity: $\tau^2 = 0.00$, $I^2 = 1$	29.07%, H ² =	1.41	•		0.01 [0.00, 0.02]	
Test of $\theta_{i} = \theta_{j}$: Q(4) = 5.64, p =	= 0.23					
Test of θ = 0: z = 2.70, p = 0.0	01					
Male						
AS P et al (2008)	58	215			0.27 [0.21, 0.33]	8.22
Chowdhury et al (2020)	30	320			0.09 [0.06, 0.13]	8.39
Deepak et al (2012)	106	202			0.52 [0.46, 0.59]	8.14
Saad et al (2013)	333	458		-	0.73 [0.69, 0.77]	8.34
Thomas et al (2019)	93	295	-	-	0.32 [0.26, 0.37]	8.27
Mahishale et al (2015)	751	1,758			0.43 [0.40, 0.45]	8.42
Mariappan et al (2016)	54	187			0.29 [0.22, 0.35]	8.17
Heterogeneity: $\tau^2 = 0.05$, $I^2 = 1$	99.07%, H ² =	107.58			0.38 [0.21, 0.54]	
Test of $\theta_i = \theta_j$: Q(6) = 645.46,	p = 0.00					
Test of θ = 0: z = 4.49, p = 0.0	00					
Overall					0.23 [0.13, 0.33]	
Heterogeneity: $\tau^2 = 0.03$, $I^2 = 1000$	99.58%, H² =	237.24				
Test of $\theta_i = \theta_i$: Q(11) = 2609.6	7, p = 0.00					
Test of $\theta = 0$: $z = 4.41$, $p = 0.0$						
Test of group differences: Q_{b} (1) = 18.89, p	= 0.00	0.2	.4 .6	.8	
			0.2	.ч .0	.0	

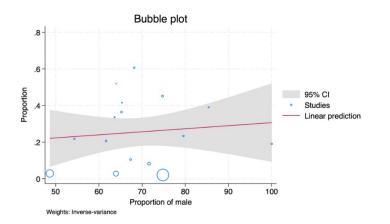
Random-effects DerSimonian-Laird model Supplementary Figure 6. Smoking prevalence among pulmonary tuberculosis patients by gender.



Supplementary Figure 7. Bubble plot of meta-regression showing the relationship between publication year and smoking prevalence among pulmonary tuberculosis patients.



Supplementary Figure 8. Bubble plot of meta-regression showing the relationship between sample size and smoking prevalence among pulmonary tuberculosis patients.



Supplementary Figure 9. Bubble plot of meta-regression showing the relationship between proportion of male and smoking prevalence among pulmonary tuberculosis patients.