Epidemiological research on brucellosis in India: knowledge generated and gaps

Ram Pratim Deka , Johanna Lindahl, Delia Grace

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Overview

- Prevalence studies
- Risk factors
- Disease economics
- Human brucellosis
- Knowledge attitude and practices
- Control options
- Conclusion

Prevalence of Brucella infection in India

State	Prevalence	Author
Throughout the country	2%	Isloor et al. 1998
Throughout the country	4%	Renukaradhya et al. 2002
Punjab	21%	Ul-Islam et al. 2013
Assam	13%	Gogoi et al. 2017
Gujarat	12%	M. D. Patel et al. 2014
Bihar	12%	Pandian et al. 2015
Andhra Pradesh	12%	Trangadia et al. 2012
Sample collected from suspected animals from different parts of the country	20-60%	Dalvi et al. 2007; Aulakh et al. 2008; S.P et al. 2011; Jagapur et al. 2013; Ul-Islam et al. 2013; Neha et al. 2014; Patel et al. 2014; Shome et al. 2015; Pathak et al. 2016
ILRI-ICAR study in Bihar	0.5%	
ILRI-ICAR study in Assam		

Prevalence

- Only 4 outbreaks of brucellosis in cattle and buffalo reported with 46 cases in 2016 (Annual Report, DAHDF, 2017)

Gap/limitations

- Many studies in India have not clearly mentioned the sampling frame
- Large scale studies on pure random sampling is required to report true prevalence
- Sero-positivity does not necessarily mean animals have current or active infection; more confirmatory studies are required
- Apart from probabilistic method, appropriate sample size, use of appropriate diagnostic test and sound laboratory methods are essential

Distribution of prevalence studies (tentative)

High: Punjab, UP, Karnataka, Gujarat, Maharashtra,…..

Medium: Tamilnadu, Karnataka, Assam, MP, Haryana, …

Low: Bihar, Odisha, West Bengal, Jharkhand, Chhattisgarh, north eastern states (except Assam), Himalayan states, ……..

Gap/limitation:

- Priority may be given to the areas where there is lesser studies

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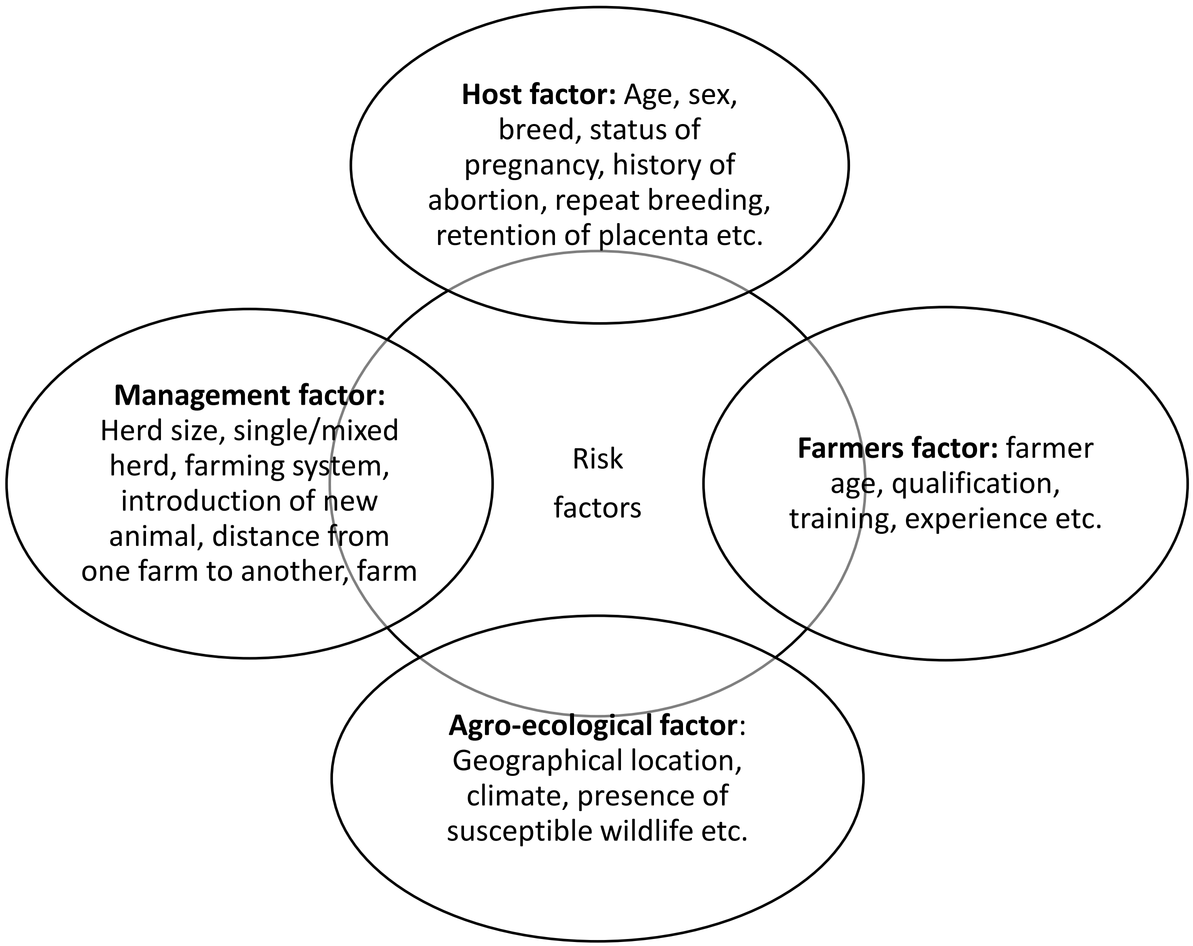
Risk factors

- Risk factors may be classified in 4 groups



Risk factors

Risk factors	Host factor	
Species	Cattle are more likely to be sero-positive than buffalo	(Kumar et al. 2016)
Age of animal	Older animals are more likely to be sero-positive than calves	(Mugizi et al. 2015)
Sex	Female dairy animals are more likely to be sero-positive than male	(Ul-Islam et al. 2013)
Breed	Purebred animals are more likely to be sero-positive than indigenous	(Shomeet al. 2014)
History of abortion	History of abortion is positively associated with sero-positivity	(Lindahl et al. 2014)
History of repeat breeding	History of repeat breeding is positively associated with sero-positivity	(Dalviet al. 2007)
History of retention of placenta	History of retention of placenta is positively associated with sero-positivity	(Aulakh et al. 2008)
History of metritis/ endometritis	History of metritis/ endometritis is positively associated with sero-positivity	(Patel et al. 2014)
Farming system	Organized farms are positively associated with sero-positivity, compared to unorganised	(Kumar et al. 2016)
Mixed herd	Cattle being housed with goat and/or sheep are more likely to be sero-positive	(Calistri et al. 2013)
Herd size	Larger herds are positively associated with sero-positivity, compared to smaller herds	(Mugizi et al. 2015)
Distance between herds/ density of herds	Herds located close to one another are positively associated with sero-positivity than located away from each other	(Soomro et al. 2014)
Breeding method	Breeding by artificial insemination is positively co-related with sero-positivity, compared to natural mating	(Shome et al. 2014)

Risk factors

Gap/limitations

- Contradictory risk factors are also reported by some studies
- Identification of risk factors requires adequate sample size and ability to accurately measure true disease status.
- Confounding factors may mask the actual association or falsely demonstrate an apparent association between the treatment and outcome.
- Establishing actual cause effect relationship is difficult without confirmatory diagnosis

Disease economics

- Terminologies like economic impact, loss, and cost of brucellosis are used by some researchers loosely and inter-changeably
- Reduced milk yield (10%) cause an economic loss of INR 2,774 per cow and INR 3,015 per buffalo cow (Panchasara 2012).
- Average costs of treatment following abortion, repeat breeding and retention of placenta of dairy cattle were estimated at INR 250, INR 320 & INR 506 (Panchasara 2012).
- Brucellosis cause 20-25% loss of milk production (Bano & Ahmad Lone 2015)
- Abortion caused a loss of INR 5,908 per animal (Dhand et al. 2005).

Disease economics (cont…)

- Brucellosis caused a median loss of USD 3.4 (INR 228) billion to the livestock sector of which 96% was in the dairy sector (Singh et al. 2015)
- Brucellosis caused an economic loss of USD 58.8 million per year to the dairy industry (Kollannur et al. 2007)

Disease economics (Cont…)

Preliminary findings of ongoing ILRI-ICAR research project

Item	Average loss
	Amount in INR
Milk yield loss	16047
Treatment loss	2975
Distress selling loss	19,375
Loss of a calf (average of male & female calf price)	3750
Loss caused by repeat breeding	515
Death of cow/heifer	0

Disease economics (cont….)

Gap

- There is paucity of comprehensive economic studies on impact of brucellosis in India
- No study has been observed on the economics of brucellosis control programme in India
- Different studies use different parameters and approaches for working out the economic impact, cost, and loss, therefore the estimates varies widely
- Difficult to extrapolate the prevalence data as sero-prevalence does not mean occurrence of the disease or loss.
- More systematic economics studies and approach are required to assess the economic impact, loss and cost of brucellosis

Human brucellosis

- Brucellosis has been reported as a major cause of pyrexia of unknown origin (PUO).
- In India, the disease is reported sporadically but the true incidence is estimated to be much higher than reported because of misdiagnosis and under reporting (Boral et al. 2009).
- Sen et al. (2002) found 6.8% sero-positive cases among the patients with PUO.
- Pathak et.al (2014) also found 6% sero-prevalence among patients with PUO.

Human brucellosis (cont…)

- Higher sero-positivity rate (27 %) was recorded in Ludhiana in a purposively sampled population (Yohannes and Sing 2011) .
- 0.8% prevalence reported among a larger group of PUO patients (Kadri, 2000)
- History of **ingestion of raw milk** (87%), **occupational contact** with animals (81%) & **handling of infected** materials (62%) were reported as the major risk factors (Kochar et al. 2007)
- Among the occupational groups, veterinarians were the most affected followed by farm workers (Yohannes et al. 2011)

Gap:

- No study has been observed in randomly selected general population

Knowledge, attitude and practices (KAP)

- ILRI-ICAR study on KAP in Bihar, India suggest the following:

Particulars	Percentage households
Heard about brucellosis	6%
Knew something about brucellosis	2%
Knowledge about transmitting brucellosis from animal to human	2%
Heard about Q-fever	0
Heard about leptospirosis	0
Wear gloves in handling aborted materials	0
Threw away aborted materials	53%
Take bath after handling aborted materials	48%
Boil milk before consumption	98%
Consume raw milk (mainly offered to children, adults take boiled milk)	15%

Gap: Dearth of studies on KAP in India

Control

- *Brucella abortus* S19 is the most widely used vaccine in the world
- *B. abortus* RB51 vaccine has proved safe and effective against bovine brucellosis & exhibits negligible interference with diagnostic serology
- Both *Brucella* S19 and RB51 vaccines are recommended by OIE
- A study in UP found that periodic testing of all animals and segregation of sero-positive animals reduces seropositive from 12.4% to 1.2% (Kollannur et al. 2007).
- Another study in Punjab found, *B. abortus* S19 vaccine reduced the rate of abortion from 8% to 1% in cows and from 3% to 1% in buffalo (Gill et al. n.d.)

Contol (cont…)

- Safe and effective vaccines against human, pig and wildlife brucellosis are not generally available (Godfroid et al. 2010)

Gap:

- Needs more action research projects on brucellosis control in field condition keeping in view the prevailing challenges in India
- More effort is required to produce safer and effective vaccines (e.g. effective in all age groups, thermostable, not interrupting in diagnostic serology etc.)
- Technological intervention may not be good enough without building knowledge & capacity of stakeholders

Conclusion

- Plenty of epidemiological studies have been conducted in India on brucellosis, many are repetitive in nature.
- Prevalence data has important bearing on milk trade and investment on control programme, so assessing true prevalence is critical
- In some part of India, epidemiological studies are relatively fewer; there is need to prioritize
- Needs well accepted, economically acceptable model for assessing disease economics.
- Customized knowledge products should be designed & implemented for the target groups
- More research may be initiated on developing a more effective vaccine for the Indian context

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Patron: Professor Peter C Doherty AC, FAA, FRS
Animal scientist, Nobel Prize Laureate for Physiology or Medicine–1996

Box 30709, Nairobi 00100 Kenya
Phone +254 20 422 3000
Fax +254 20 422 3001
Email ilri-kenya@cgiar.org

ilri.org
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ILRI is a CGIAR research centre

Box 5689, Addis Ababa, Ethiopia
Phone +251 11 617 2000
Fax +251 11 667 6923
Email ilri-ethiopia@cgiar.org

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