Meta-Analysis of predictive symptoms for Ebola virus disease in West Africa

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Background: One of the leading challenges in the West African Ebola virus disease (EVD) outbreak in 2014/15 was how best to quickly identify patients with Ebola, separating them from those without the disease. This meta-analysis aggregates all available data on symptom predictors for Ebola. This will enable quicker diagnosis of probable cases in resource-limited settings, and earlier stratification of patients as high-risk, permitting appropriate clinical and public health precautions to be taken.

Methods & Materials: Identification of relevant existing literature was performed by an online search in MEDLINE and EMBASE for studies published from 1st January 1946 to 11th September 2017. The MESH headings (keywords) included “ebola” and “symptom*” or “clinical” or “predict*” or “suspect*”. The initial search on MEDLINE and EMBASE produced 4380 results. After exclusion criteria and further review, there were seven papers that met our criteria.

For each predictive symptom investigated, EVD and non-EVD patients were aggregated across studies. We then used a random effects meta-analysis model in STATA. This provided a pooled odds ratio along with 95% confidence intervals and a p-value, for each symptom; with detailed forest plots.

Results: Fatigue was the most predictive for Ebola (OR 3.29, 95% CI 1.89-5.71), with anorexia (OR 3.11, 95% CI 1.40-6.94), confusion (OR 3.04, 95 CI 2.18-4.23) diarrhoea (OR 3.02, 95 CI 1.89-4.85), conjunctivitis (OR 2.99, 95 CI 1.77-5.04), vomiting (OR 2.89, 95 CI 1.79-4.67), fever (OR 2.37, 95 CI 1.33-4.21), hicups (OR 2.25, 95 CI 1.23-4.08) and dysphagia (OR 2.22, 95 CI 1.18-4.18) all more than twice as likely in Ebola cases. Chest pain, bleeding, and sore throat were not statistically significant predictors of Ebola.

Conclusion: Existing literature fails to provide a unified position on the most predictive symptoms for Ebola. This analysis demonstrates that late presenting symptoms including confusion, anorexia, conjunctivitis and hicups are predictive for Ebola. However, early non-specific symptoms of fatigue, fever, diarrhoea, vomiting were also highly predictive. These findings will aid effective future clinical assessment, risk stratification tools and emergency epidemic response.

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