

Measles outbreaks: why vaccination hesitancy must be confronted head-on

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INTRODUCTION

Measles, also known as Rubeola, is a highly contagious acute febrile viral illness caused by the measles virus, a member of the morbillivirus genus and *Paramyxoviridae* family.¹ Like all morbilliviruses, measles is highly contagious and transmitted via the respiratory route.² The epidemiology of measles in the United Kingdom (UK) has a complex history. Notification of measles began in England and Wales in 1940. Prior to the introduction of the first measles vaccine in 1968, approximately 80% of the UK population experienced measles during childhood. Following the introduction of the initial measles vaccine, the number of cases gradually declined until the introduction of the combined measles, mumps, and rubella (MMR) vaccine in 1988, which further reduced cases. To increase vaccination success, a two-dose MMR vaccination schedule was implemented for all children in 1996.³

Despite the existence of a safe and effective vaccine, measles remains a significant cause of mortality worldwide, particularly among infants. In 2010, the World Health Assembly aimed to reduce measles mortality by 95%, but despite substantial progress, this target was not achieved.⁴ Measles vaccination is estimated to have prevented 56 million deaths globally between 2000 and 2021; however, in 2021, an estimated 128,000 measles-related deaths occurred worldwide.⁵ Most ongoing cases of measles infection occur in unvaccinated or under-vaccinated children under the age of five, as vaccination rates worldwide have reached their lowest levels since 2008.⁵ Due to declining vaccination rates and increasing incidence, measles poses a major threat to public health.⁶

MEASLES: A CLINICAL OVERVIEW

Measles is transmitted via the respiratory route and is absorbed through the host's nasopharyngeal or conjunctival mucosa. It initially targets lymphatic tissue, where it infects and replicates within lymphocyte cells approximately 2-3 days after exposure. Subsequently, it disseminates into the bloodstream, leading to viremia approximately one week later. The onset of the prodromal phase coincides with onset of the viremia. The incubation period, defined as the interval from exposure to prodromal symptoms, ranges from 7 to 18 days.⁷

Clinically, measles can be delineated into three phases. The prodromal phase is characterised by escalating fever and the classic triad of symptoms known as the "three Cs": cough, conjunctivitis, and coryzal symptoms.⁷ Towards the end of this phase, typically 1-2 days prior to rash onset, characteristic white, "grain of salt" lesions known as Koplik spots may appear on the buccal mucosa, although they are present in only around 60% of cases.⁸ The rash, initially comprising red macules, tends to become confluent over the course of approximately one week before receding in the same pattern as its emergence. A distinguishing feature of measles rash is its sparing of the palms and soles.^{9, 10} The convalescent phase

ensues as the rash begins to fade, often leaving behind brown discoloration and desquamation, while associated malaise and fever diminish.⁷ Additional symptoms may include headache, pharyngodynia, photophobia secondary to iridocyclitis, and abdominal pain. Generalised lymphadenopathy may also be observed upon lymph node examination.¹¹

The measles virus exhibits tropism for multiple organ systems and cell types, including epithelial and white blood cells. Complications can affect various organ systems, with mechanisms ranging from epithelial damage to immunosuppression due to cluster of differentiation 4 (CD4) cell destruction. Pneumonia represents the leading cause of measles-associated mortality and is the most severe complication, potentially stemming from either direct viral pneumonia or secondary bacterial infection facilitated by immunosuppression. Otitis media constitutes the most common complication overall, possibly due to eustachian tube epithelial damage predisposing to bacterial superinfection. Additional complications encompass diarrhoea, keratitis, febrile seizures, and mastoiditis.¹²

Diagnosing measles can be challenging, particularly for healthcare providers lacking prior experience with the disease. While primarily a clinical diagnosis predicated on exposure history and characteristic symptoms, confirmation typically involves oral fluid (OF) testing for specific antibodies.¹³ The laboratory investigation for measles involves several types of samples, each with its advantages and limitations. OF is the preferred sample for measles surveillance in the UK due to its minimally invasive nature and ability to test for measles IgM, IgG, and RNA. OF can reliably confirm or exclude measles diagnosis, indicate primary or breakthrough infection, and allow for genotyping. Serum samples are used for IgM/IgG detection and are essential for assessing the immune status of contacts. Mouth swabs can be used for polymerase chain reaction (PCR) within six days of rash onset and are valuable for distinguishing wild-type virus from vaccine-derived virus. Throat swabs or nasopharyngeal aspirates are also used for PCR within six days of rash onset. Urine samples are not advised for measles testing due to variability. Ethylenediamine tetra acetic acid (EDTA) blood samples can be used for testing if no other suitable sample is available but are generally less sensitive than oral fluid or nasopharyngeal aspirates. Nose swabs and eye swabs are not suitable for measles testing.¹⁴

Suspicious should be heightened in unvaccinated or under-vaccinated individuals presenting with febrile illness and a rash consistent with measles. Management commences with prompt notification to public health authorities, due to the disease's high transmissibility and notifiable status. Given its self-limiting nature, measles generally resolves within a week with supportive care, encompassing adequate hydration, rest, and analgesia. Vigilant monitoring for complications is imperative, necessitating prompt medical attention if suspected. Preventive measures to curtail further transmission include isolating suspected cases from susceptible individuals, including pregnant women, infants, and immunocompromised individuals, for at least four days post-rash onset.¹⁵

OUTBREAKS: A PUBLIC HEALTH PERSPECTIVE

In recent times, the global landscape has witnessed a disconcerting resurgence of measles, prompting international health organisations to issue urgent warnings. The World Health Organisation (WHO), a key body in global health, has raised an alarm regarding a staggering 30-fold increase in measles cases across Europe, a surge that demands a thorough examination from a public health perspective.¹⁶ Between January and October 2023, over 30,000 cases were reported, marking a drastic escalation compared to a mere 941 cases in the entirety of 2022.¹⁶ This alarming surge in measles cases brings to light the vulnerability of populations to infectious diseases.

Globally, the impact of the outbreak extends across age groups, with two in five cases affecting children between the ages of one and four. Equally concerning is the surprise that one in five cases occurs in individuals aged 20 and above, challenging the common perception that measles is solely a childhood illness.¹⁷ The WHO predicts these numbers will increase without a public health strategy.¹⁶ The urgency of such outbreaks is also echoed nationally in the UK Health Security Agency (UKHSA) declaring a national health incident with the rising cases. The Chief Executive of the UKHSA, Professor Dame Jenny Harries has issued a warning on the rapidly growing cases, unless immediate steps are taken to boost MMR vaccination rates.¹⁸ As of January 19th, 2024, the West Midlands reported 216 confirmed cases, and 103 probable cases with 80% concentrated in Birmingham and 10% in Coventry.¹⁸

VACCINATION STIGMA: UNDERSTANDING THE CHALLENGES

In 2023, statistics from the UKSHA revealed that 89.3% of children aged 24 months had received their first dose of the MMR vaccine, reflecting a slight decline from 90.3% in 2021. This figure falls significantly below the 95% threshold targeted for achieving herd immunity as set forth by the UKSHA.¹⁹ Notably, childhood vaccination coverage data demonstrates substantial regional disparities in MMR vaccine uptake across the UK. For instance, in 2023, the highest coverage rate was observed in South Tyneside, Northeast England, at 97.3%, while the lowest was recorded in Hackney and the City of London at 68.1%.²⁰ The rise in suspected measles cases in England and Wales, totalling 1603 in 2023 compared to 360 cases in 2021, appears to correlate with the decline in vaccination rates.²¹

Controversy surrounding the MMR vaccine dates back to 1998 when former doctor Andrew Wakefield alleged a connection between the vaccine and autism in a paper published in *The Lancet*. Wakefield's case report posited that the vaccine might predispose children to behavioural regression and developmental disorders; however, subsequent investigations refuted these claims, failing to establish a causal link between the MMR vaccine and autism. It later emerged that Wakefield had manipulated data for personal financial gain, resulting in his conviction for deliberate fraud.²² Studies have demonstrated a clear association between Wakefield's publication and subsequent declines in MMR vaccination rates.²³ Although vaccination rates have gradually increased over time, they persist below the threshold required for herd immunity in the UK. Concurrent with the Wakefield controversy

was the proliferation of internet and social media platforms, which have facilitated the dissemination of misinformation and anti-vaccination propaganda.^{23, 24} Given the considerable influence of social media on modern healthcare, with approximately 90% of adults aged 50 or older reportedly using such platforms to access and share health-related information,²⁵ it is imperative for healthcare professionals to steer the public towards reliable and authoritative sources of health information.

THE IMPORTANCE OF VACCINATION

The MMR vaccination programme is available on the NHS as part of the normal childhood immunisation programme in the UK. The programme aims to protect individuals, especially children from these three infectious diseases. The MMR dose is typically administered in two doses, the first being given at around one year of age, and the second dose usually administered at three years four months of age. The MMR combines three different vaccines (for measles, mumps, and rubella) into a single injection. Effectiveness rates are over 99% for measles and rubella. Whilst protection against mumps is lower, individuals who are vaccinated will have less severe disease processes. The MMR vaccine is free of charge on the NHS. Catch-up vaccinations are also available.¹⁸

The MMR vaccination programme is not only a cornerstone in shielding individuals, especially children, but also contributes significantly to the broader public health goal of establishing resilient herd immunity. This collective immunity not only shields those unable to receive the vaccine due to medical reasons but also acts as a communal defence, limiting the spread of these infectious diseases within the population.²⁶

HEALTHCARE PROFESSIONALS – ROLE AND RESPONSIBILITIES

Measles is a notifiable disease under the Health Protection Regulations. This means all cases should be reported when there is a clinician suspicion of measles infection. Prompt organisation of OF tests is essential. In primary care settings, it is crucial to promptly identify and isolate patients with fever and rash, directing them to side rooms if they present while others are in the waiting room. GPs should notify hospital staff ahead of time when referring suspected measles cases to A&E, ensuring appropriate isolation upon arrival, and conducting risk assessments with support from Health Protection Teams (HPTs) as needed. In acute hospital settings, suspected measles cases require isolation, with the hospital's infection control team informed to undertake risk assessments, identify exposed patients, particularly immunosuppressed individuals, and collaborate with HPTs for follow-up and management of contacts now in the community. A full national measles guideline has been updated in February 2024 by the UKHSA.¹⁴

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