STI Cases

CAC Provider Conference

Jennie Green, MD, MSc

Child Abuse Pediatrician

Assistant Professor of Pediatrics

UK Pediatric Forensic Medicine

STI Prevalence in Children

- In prepubertal children who were evaluated for concerns of sexual abuse, the prevalence of Chlamydia trachomatis infection was 6.7% and Neisseria gonorrhea infection 1.8% [Adams 2018]
- In a study looking generally at female children (not with a specific history of sexual abuse), prevalence of latent Human Papilloma Virus infection was approximately: [Bacopoulou et al 2016]
  - 25% of non-sexually active adolescent females
  - 50% of sexually active adolescent females
  - 33% of prepubertal females (important to consider this when warts present at later ages)
- In adolescents and teenagers, the rates of all STI increase significantly.
  - Adolescents: 15-19 yo age group [second highest STI prevalence behind 20-24 yo age group] as per CDC

    Chlamydia prevalence rate: 1739.5 per 100,000

    Gonorrhea prevalence rate: 438.7 per 100,000

STI Presentation

- In prepubertal children, there is a decreased risk of acquisition of STIs in general and decreased risk of ascending infection should the child become infected.
- In prepubertal children, Gonorrhea and Chlamydia can present as vulvovaginitis with discharge, dysuria, or be asymptomatic.
- In adolescents, STIs can present similarly to adults with dysuria, cervicitis and pelvic inflammatory disease or be asymptomatic.

Risk Factors that Increase STI Transmission

- Female child
- Penetrative contact to vagina/anus by penis
- High risk assailant (substances, STI, incarceration)
- High prevalence of STI in community
- Anogenital or oral injury occurring prior to or during contact

Testing Quick Reference:
Higher Risk Contact

i.e. Penile-vaginal, penile-anal, contact with possible infection fluids on mucosal surface, STI symptoms regardless of disclosure

- Initial:
  - Urine NAAT for Gonorrhea/Chlamydia/Trichomonas
  - Oral and anal swab NAAT Gonorrhea/Chlamydia
  - Blood: Hepatitis B, Hepatitis C, HIV, Syphilis
  - HCG (if pubertal or SMR2-3)
- 2 Week:
  - Urine NAAT for Gonorrhea/Chlamydia/Trichomonas
  - Oral and anal swab NAAT Gonorrhea/Chlamydia
  - HCG (if pubertal or SMR 2-3)

Testing Quick Reference: Higher Risk Contact

- 6 Week:
  - HIV
  - Syphilis
  - HCG (if pubertal)
- 12 Week:
  - HIV
  - Syphilis

Testing Quick Reference: Moderate Risk Contact

i.e. oral-anogenital contact, possible contact with infected fluids on mucosal surface

- Initial:
  - Urine NAAT for Gonorrhea/Chlamydia/Trichomonas
  - Oral and anal swab NAAT Gonorrhea/Chlamydia
  - Consider with shared decision making:
    - Blood: Hepatitis B, Hepatitis C, HIV, Syphilis
    - HCG (if pubertal)
- 2 Week:
  - Urine NAAT for Gonorrhea/Chlamydia/Trichomonas
  - Oral and anal swab NAAT Gonorrhea/Chlamydia
  - Consider:
    - HCG (if pubertal)
- Consider 6 week, 12 week follow up for blood labs depending on patient/family comfort, shared decision making

Testing Quick Reference:
Lower Risk Contact
i.e. Digital-anogenital contact

- Initial:
  - Urine NAAT for Gonorrhea/Chlamydia/Trichomonas
  - Oral and anal swab NAAT Gonorrhea/Chlamydia
  - Not recommended, however, consider with shared decision making:
    - Blood: Hepatitis B, Hepatitis C, HIV, Syphilis
    - HCG (if pubertal)
- 2 Week:
  - Urine NAAT for Gonorrhea/Chlamydia/Trichomonas
  - Oral and anal swab NAAT Gonorrhea/Chlamydia
  - Consider:
    - HCG (if pubertal)
- Consider 6 week, 12 week follow up for blood labs depending on patient/family comfort, shared decision making

Confirmatory Testing

- Also called Second Target Testing
  - Differentiates between different species of Chlamydia [12 total, 3 disease causing in humans] and Neisseria [28 total, 2 disease causing in humans]
- REQUIRED for all prepubertal children and some pubertal children (cognitively delayed, no prior sexual partners) for urine PCR/NAAT/NAA positive for Neisseria Gonorrhea and Chlamydia Trachomatis in cases of suspected SA.
- Many labs now have confirmation testing for swabs positive for Chlamydia and Gonorrhea. Some even have Trichomonas.
- Call your lab to find out what they have and how to order it if you do not know.
- Confirmation testing for urine and swab samples involves the lab testing for a second genetic sequence in the pathogen to verify that the infection is indeed by Neisseria Gonorrhea and/or Chlamydia Trachomatis
- Of note, you may be asked if finding out the specific strain of the pathogen (NG/CT) is helpful forensically and it has NOT been found to be helpful, thus is not recommended

Case One

- 2 yo female presented to the ED by mom with complaint of yellow/white purulent vaginal discharge that started one day ago.
- Testing?
  - Urine PCR/NAAT/NAA for Chlamydia, Gonorrhea, and Trichomonas
  - Swab PCR/NAAT/NAA for Chlamydia and Gonorrhea of vaginal discharge, rectal area, and pharynx
  - Urinalysis
  - Urine Culture
- Resulted as positive for Neisseria Gonorrhea on both vaginal discharge swab and urine

Case One

- Next Steps?

Case One

- Confirmatory testing [New sample? Same sample? Swab? Urine? Both?]
- Additional studies to include testing for HIV, Syphilis, Hepatitis B, Hepatitis C
- Treatment of infection
  - Ceftriaxone 25-50 mg/kg IM/IV x 1 dose [max 250 mg]
- Additional History from caregiver
- Reports to LE and CPS
- Follow up needs
  - CAC
  - DCBS/LE

Case One

- Confirmatory testing on both swab and urine returns as confirmed positive Neisseria Gonorrhea
- You recommend to investigators that all caregivers of the child be tested for Gonorrhea as soon as possible
- Incubation period is 3-5 days
- How is Neisseria Gonorrhea transmitted?
  - SEXUAL CONTACT
  - Perinatal Transmission
  - Theoretical/rare non-sexual transmission
    - Wet washcloth with secretions from Gonorrhea infected caregiver then applied to child's genitals while still moist [all conditions must be met AND still theoretical]
    - Gonorrhea requires a moist environment to retain infective potential
      - Transmission requires child's genital contact with moist infected secretions [oral/genital]

Case One

- Perinatal transmission
  - Usually presents with infection 2-5 days after birth although most should present within 1st month of birth; after neonatal period (first 28 days), much less likely
  - More typical infections are ophthalmia neonatorum, nasopharyngeal infection, scalp abscesses, sepsis
  - Many prenatal appts or (in case of insufficient PNC) delivery hospitals perform maternal testing for infections, highly recommend asking for these records from caregivers/investigators if maternal transmission is suspected
- Post-natal non-sexual transmission
  - The wet washcloth/bath towel/etc [theoretical, lab based studies]
    - "However gonococci have been recovered from pus on linen kept moist with sterile saline after 5 h and in one case after 22 h, although could not be recovered by culture after 2 h if the cloth was kept dry"
    - Gonococcal pus placed on glass slides and on towel kept at room temperature has been shown to survive for up to 24 h on the towel and 17 h on the slide
    - Cultured from contaminated bathwater after 24h
    - No growth on toilet seats without purulent suspension
    - Requires purulent suspension if surviving on dry or moist surfaces with condition that purulent suspension does NOT dry out [i.e. would require the caregiver in question to have purulent discharge as a symptom of their infection AND use of the same linen depositing the discharge AND use of that exact same spot of linen w discharge on the child's genitals AND for it not to dry out between uses]

Division of STD Prevention, National Center for HIV, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention

Case One

- Case Reports of Non-Sexual Transmission
  - Toddler son of lab worker ate chocolate agar plate with NG on it, developed pharyngeal gonorrhea
  - Lab accidents involving contaminated objects or fluids coming in contact with lab worker's eyes causing conjunctivitis
  - Cultural practice of using urine as eyewash resulted in group of boys with conjunctivitis
  - In much older times (1800's, early 1900's), unwashed and contaminated rectal thermometers, gloves, linens caused genital NG outbreaks in children's wards
  - One case report from 2004 saying a little girl got genital NG infection from using a toilet seat on a trans-continental flight and wiping the toilet seat with tissue and somehow getting an infectious fluid on finger in process and then putting supposedly contaminated finger on genital tissues
    - Of note, it did not say there was discharge on the seat just that it was "dirty" and the flight was full
    - Also of note, SA was "ruled out" bc the parents said that that didn't happen and bc the NM asked the child and the child told NM that no one had touched her genitals and bc the child had no obvious reported behavioral manifestations
    - All caregivers tested negative (unsure when tested in regard to when child diagnosed) [of note, relatives they went to visit were not noted to have been tested]

Table 2.5

Implications of Commonly Encountered Sexually Transmitted (ST) or Sexually Associated (SA) Infections for Diagnosis and Reporting of Sexual Abuse Among Infants and Prepubertal Children

ST/SA Confirmed	Evidence for Sexual Abuse	Suggested Action
Neisseria gonorrhoeae[a]	Diagnostic	Report[b]
Syphilis[a]	Diagnostic	Report[b]
Human immunodeficiency virus[c]	Diagnostic	Report[b]
Chlamydia trachomatis[a]	Diagnostic	Report[b]
Trichomonas vaginalis[a]	Diagnostic	Report[b]
Anogenital herpes	Suspicious	Consider report[b,d]
Condylomata acuminata (anogenital warts)[a]	Suspicious	Consider report[b,d,e]
Anogenital molluscum contagiosum	Inconclusive	Medical follow-up
Bacterial vaginosis	Inconclusive	Medical follow-up

[a]If not likely to be perinatally acquired and rare vertical transmission is excluded.

[b]Reports should be made to the local or state agency mandated to receive reports of suspected child abuse or neglect.

[c]If not likely to be acquired perinatally or through transfusion.

[d]Unless a clear history of autoinoculation exists.

Red Book 2021-2024; Report of the Committee on Infectious Diseases; 32nd Edition

Case Two

- 7 yo female presents to PCP office with small amount of white vaginal discharge and dysuria for two days
- PCP orders a urinalysis/culture and swabs the discharge using a PCR test thinking it is likely yeast; the test they ordered included candida, BV, E. Coli, Strep, Staph, Chlamydia, Gonorrhea, Trichomonas
- Returns as positive for Chlamydia trachomatis two days later.
- Next Steps?

Case Two

- Additional testing:
  - Repeat urine and vaginal swab PCR/NAAT/NAA testing for Gonorrhea, Chlamydia, and Trichomonas with reflex second target confirmation testing for Gonorrhea and Chlamydia on the urine and vaginal swab specimens [confirmed positive for Chlamydia trachomatis]
  - Rectal and pharyngeal PCR/NAAT/NAA swab for Gonorrhea and Chlamydia
  - Blood testing for Syphilis, Hepatitis B, Hepatitis C, HIV
  - Treatment for Chlamydia
    - Erythromycin 50mg/kg divided QID x 14 days [can be VERY difficult for families to administer, recommend close follow up]
  - Follow up at CAC for FI and medical evaluation
- What do you think?

Case Two

- Incubation period is 7-14 days
- Sexual transmission [anogenital contact of child with moist infected fluids (oral/anogenital)]
- Perinatal transmission
  - If mother is infected at time of vaginal delivery, 50-75% of infants may acquire CT disease at potentially multiple sites (conjunctiva (presents 1-2 weeks after birth), nasopharynx, respiratory tract (presents 4-12 weeks after birth), anogenital (often asymptomatic))
  - Most common sites of infection are conjunctiva and nasopharynx and asympmtomatic infection has been identified in the nasopharynx up to 3 years of age
  - Again, request maternal records to note if testing performed and when and ask about STIs when obtaining history from caregivers
- Non-sexual transmission
  - Theoretically auto-inoculation [child touches nose/eyes then genitals, should be able to demonstrate through testing that extra-genital sites are positive for CT; does not rule out sexual abuse however as the opposite can be true (genitals infected and then spread to nose)]
  - Fomite transmission [in vitro, nonporous surface]
    - ”Under ambient conditions, the TP50 (time at which 50% of samples were positive for Chlamydia) was 5 min, with complete desiccation occurring at 45 min. Under humid conditions, the TP50 was 52.5 min and complete desiccation did not occur up to 3 h. Beyond 45 min, a significantly greater number of positive chlamydial samples were collected under humid conditions (11 of 30) than under ambient conditions (0 of 30) ($p = 0.00016$).” [Novak, 1995]

Case Three

- 3 yo female presents with new onset perianal warts. Parents denied any other vaginal or anal symptoms. No other findings of concern on exam.
- What history would be helpful?

Case Three

- NM reports history of abnormal pap smear at some time prior to pregnancy but unknown when. Did not get follow up. Denies personal history of anogenital warts.
- Brother has warts on hands and knees.
- You recommend the following:
  - Urine PCR/NAAT/NAA for Gonorrhea, Chlamydia, Trichomonas
  - PCR/NAAT/NAA rectal and pharyngeal swabs for Gonorrhea and Chlamydia
  - Serum for Hepatitis B, Hepatitis C, HIV, Syphilis
- All other testing negative.
- Treatment options?
  - Depends upon level of discomfort (both physical and emotional) as well as any symptoms of impairing urinating/defecating
- What do you think?

Case Three

- Perinatal and non-sexual transmission
  - Noted as most likely source of infection in children up to age 7
    - Most commonly will see children present at 2-3 years of age
  - Caregiver(s) may have history of genital warts, abnormal pap smear, or no history if not receiving routine pap smears or gap in testing
  - Can be spread by birth, contaminated hands, contaminated objects
  - Warts can present on vaginal and/or perianal tissues and involve mucosal surfaces including the hymen; number and/or location of warts does not correspond to risk of being caused by SA
- Auto-inoculation
  - Can spread perianal warts to vaginal area of self (or other places) and vice versa
- HPV – 100s of strains
  - Cutaneous HPV strains typically do not infect anogenital tissues
  - Mucosal HPV strains (about 40) can cause warts, precancerous/cancerous lesions of mucosal surfaces including anogenital tissues, mouth, pharynx, trachea, bronchi; most typical strains to infect anogenital tissues are 6 and 11
  - Typing of the HPV strain is not forensically indicated as it is ultimately not helpful given how easy HPV is to transmit and the number of ways in that it can be transmitted

References

- Bacopoulou, F., Karakitsos, P., Kottaridi, C., Stefanaki, C., Deligeoroglou, E., Theodoridou, K., Chrousos, G. P., & Michos, A. (2016). Genital HPV in children and adolescents: Does sexual activity make a difference? Journal of Pediatric and Adolescent Gynecology, 29(3), 228 233. https://doi.org/10.1016/j.jpag.2015.08.010
- Red Book 2021-2024; Report of the Committee on Infectious Diseases; 32nd Edition
- Division of STD Prevention, National Center for HIV, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention
- Hammerschlag MR. Chlamydia trachomatis and Chlamydia pneumoniae infections in children and adolescents. Pediatr Rev. 2004 Feb;25(2):43-51. doi: 10.1542/pir.25-2-43. PMID: 14754926.
- Goodyear-Smith F. What is the evidence for non-sexual transmission of gonorrhoea in children after the neonatal period? A systematic review. J Forensic Leg Med. 2007 Nov;14(8):489-502. doi: 10.1016/j.jflm.2007.04.001. Epub 2007 Jul 30. PMID: 17961874.
- Dayan L. Transmission of Neisseria gonorrhoeae from a toilet seat. Sex Transm Infect 2004;80(4):327
- Cohn A, Steer A, Adler E. Gonococcal vaginitis: a preliminary report on one year's work. Venereal Dis Inform 1940;21:208–20. 33.
- Felman YM, Nikitas JA. Gonococcal infections in infants and children. Medical and epidemiologic considerations. New York State J Med 1979;79(7):1063–5. 34. Israel KS, Rissing KB, Brooks GF. Neonatal and childhood gonococcal infections. Clin Obstet Gynecol 1975;18(1):143–51
- Alausa K, Sogbetun A, Montefiore D. Effect of drying on Neisseria gonorrhoeae in relation to nonvenereal infection in children. Nigerian J Pediatr 1977;4(1):14–8
- Srivastava AC. Survival of gonococci in urethral secretions with reference to the nonsexual transmission of gonococcal infection. J Med Microbiol 1980;13(4):593–6
- Lipsitt HJ, Parmet AJ. Nonsexual transmission of gonorrhea to a child. N Engl J Med 1984;311(7):470