Condoms to prevent HPV infection, external genital warts, or cervical neoplasia: Evidence and implications for public health

Quality Assessment Rating: 5 (moderate)

Review on which this summary statement is based

Review Author
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This is a summary statement written to condense the work of the authors of this systematic review, referenced above. The intent of this summary is to provide an overview of the findings and implications of the full review. For more information on individual studies included in the review, please see the review itself.

Review content summary
This systematic review with meta-analysis of 20 primary studies (cohort, case-control, and cross-sectional) was conducted to evaluate the effectiveness of condom use in preventing human papillomavirus (HPV) infection and HPV-related conditions. Evaluations were separated into the following five outcomes of interest: 1) external genital warts, 2) HPV DNA detection in genital samples, 3) cervical warts and SIL or cervical intraepithelial neoplasia (CIN) (grade 1 or unspecified), 4) CIN II or III, and 5) ICC (squamous cell carcinoma and adenocarcinoma not differentiated). Pooled odds ratios were not calculated because of the significant heterogeneity present in each group. Although there is some evidence that suggests condoms may protect against genital warts, the review revealed that there is no consistent evidence that condoms reduce the risk of HPV infection, CIN II or III, and ICC.

Comments on this review’s methodology
This review is of moderately strong methodological quality. The authors used three sources, MEDLINE, reference lists from each selected article, and discussions with key informants, to identify studies for inclusion in the review. The search included studies from 1980 to 2002. A total of 20 studies met the following inclusion criteria: 1) a clear definition of end point (HPV infection; HPV type; warts, SIL, CIN: cancer), 2) an exclusive definition of condom use, and 3) an appropriate comparison group. The studies were of cross-sectional or case-control design. A major limitation of this review is the lack of a comprehensive assessment of the methodological quality of the primary studies on which it is based. A test of homogeneity was conducted and, because of the substantial heterogeneity, the results were not pooled through meta-analysis. Much of the data were too inconsistent to draw strong conclusions about the use of condoms against the different types of infections.

Why this issue is of interest to public health
Health Canada considers human papillomavirus (HPV) to be one of the most common sexually transmitted infections in Canada, with an estimate of 75% Canadians having at least one HPV infection over their lifetime. The Society of Obstetricians and Gynaecologists of Canada estimates that 10% to 30% of the Canadian adult population is infected with HPV, and applied to current Canadian population statistics, this figure translates to an estimated three to nine million Canadians infected. To add to the concern of the spread of this STI is the association between HPV infection and cervical cancer. Persistent HPV infection is the major cause of over 99% of cervical cancers and may also play a role in cancers of the anus, penis, and oropharynx (in the throat at the back of the mouth). In July 2006, a new HPV vaccine was approved for use in Canada with recommendations for use from the National Advisory Committee on Immunization to be released soon. Because of the widespread use of condoms to prevent unwanted pregnancies and the transmission of other STIs, evaluating the effectiveness of condom use in preventing HPV infection is an area of interest for public health. Because an HPV infection is spread through any sexual skin-to-skin contact, it is possible to become infected with HPV from contact with any uncovered warts.

Evidence and implications
Evidence points are weighted or ranked according to strength
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<tr>
<th>What's the evidence?</th>
<th>Implications for practice and policy:</th>
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<tbody>
<tr>
<td><strong>1. Condom use and external genital warts (2 studies)</strong></td>
<td><strong>1. Condom use and external genital warts</strong></td>
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<tr>
<td>1.1. Results showed that the use of condoms statistically significantly reduced the likelihood of external genital warts in both men and women. The percentage reduction was 70% among males and 40% among females.</td>
<td>1.1. To reduce the transmission and incidence of genital warts, public health professionals should promote the use of condoms in both males and females.</td>
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<td><strong>2. Condom use and cervical HPV DNA (6 studies)</strong></td>
<td><strong>2. Condom use and cervical HPV DNA</strong></td>
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<td>2.1. These 6 studies showed wide variance in the effectiveness of using condoms to reduce cervical HPV DNA detection rates. Four studies found no impact associated with condom use, one study showed a strong protective effect, and one study showed a harmful effect. 2.1.1. The one study showing a statistically significant protective effect for condom use reported an 80% reduction in cervical HPV infection for those always using condoms compared to those who never used condoms. The true effect (95% confidence interval) ranged from a 90% to 40% reduction in cervical HPV infection. 2.1.2. The one study reporting a statistically significant harmful effect of condom use reported a 1.5 times increased risk of cervical HPV infection for those always or mostly using condoms to those never using condoms. The true effect ranged from 1.1 to 2.0 times more likely to contract a cervical HPV infection. 2.1.3. Methodological concerns. It is likely that some of these studies were underpowered and thus unable to detect a statistically significant impact. Measures of condom use varied and were not necessarily validated. Data on time intervals were lacking. All but one of these studies had a cross-sectional design.</td>
<td>2.1. It remains unclear as to whether or not condom use provides protection against cervical HPV DNA detection. 2.2. High quality program evaluations and other research are required. (see implication #6)</td>
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<tr>
<td><strong>3. Condom use and cervical warts, squamous intraepithelial lesions (SIL), or cervical intraepithelial neoplasia (CIN) grade I or grade unspecified (4 studies)</strong></td>
<td><strong>3. Condom use and cervical warts, SIL, or CIN grade I or grade unspecified</strong></td>
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<tr>
<td>3.1. Results were mixed regarding the effectiveness of condoms in preventing cervical warts or SIL or CIN I or CIN (grade unspecified). 3.1.1. Three studies revealed no effect on any outcomes. 3.1.2. The one study reporting a harmful effect of condom use reported a 1.8 times greatly likelihood of cervical warts, SIL, or CIN grade 1 for those using condoms compared to those who didn’t. However, methodological concerns were noted with this study (the final effect size was not adjusted for potential confounding factors and significant differences were noted between intervention and control groups).</td>
<td>3.1. It remains unclear as to whether or not condom use provides protection against cervical warts, SIL, or CIN I. 3.2. High quality program evaluations and other research are required (see implication #6),</td>
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<td><strong>4. Condom Use and CIN II or III (6 studies)</strong></td>
<td><strong>4. Condom Use and CIN II or III</strong></td>
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<td>4.1. The results are mixed regarding the effectiveness of condom use as a protection against CIN II or III. 4.1.1. Three studies found a significant protective effect for CIN III and two studies for both CIN II and III. 4.1.2. Three studies found no protective effect 4.1.3. For studies reporting positive effect reductions in CIN II or III ranged from 40-70%.</td>
<td>4.1. There is sufficient evidence to recommend condom use to prevent CIN II and III. 4.2. However, given conflicting results high quality program evaluations and other research are required. (see implication #6)</td>
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<td><strong>5. Condom Use and invasive cervical cancer (ICC) (5 studies)</strong></td>
<td><strong>5. Condom Use and ICC</strong></td>
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<tr>
<td>5.1. The results of this review are mixed regarding the effectiveness of condom use to protect against ICC. 5.1.1. One study found that condom use is statistically significantly protective against ICC, however methodological concerns were noted (e.g., subjects were monogamous females with condom use reported by husband). 5.1.2. Four studies found that condom use had no impact on ICC.</td>
<td>5.1. Generally the evidence does not suggest that condom use is protective against ICC. 5.2. High quality program evaluations and other research are required. (see implication #6)</td>
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5.1.3. None of the studies found that condoms were associated with an increased risk of ICC.

6. Methodological concerns

6.1. All of the studies included in the review were not designed to measure condom use and did not include valid measures of frequency of use vs. frequency of sexual intercourse, correct type or coverage, precise measures of use (e.g., generally assessment involved always or never used), or participants experience with condom use.

6.2. It is possible that the power of many of the studies was not sufficient to determine statistical significance.

6.3. Lack of or inconsistencies in control for confounders made interpretation of the results of this review difficult.

6.4. All studies included in this review involved women but only two involved men.

6.5. The differing results and sub-populations of women represented in the studies may indicate that certain sub-populations are protected differently than others.

6. Methodological concerns

6.1. High quality research studies should be funded and conducted that:

6.1.1. Use valid measures of condom use for contraception and protection against sexually transmitted infections, condom failure rates, and sexual behavior.

6.1.2. Assess the effectiveness of condom use on HPV transmission among both male and female populations.

6.1.3. Involve assessment of the impact of subgroups of populations according to risk status, frequency of intercourse, experience with condom use, age, and number of partners.

6.1.4. Involve partners as respondents.

6.1.5. Involve baseline measures and long term follow-up.

6.1.6. Are sufficiently powered to determine statistical significance.

6.1.7. Control for potential confounders.

General Implications

• The results of this review were mixed regarding the protective effect of general condom use on the transmission of HPV, CIN II or III, IPP. However, for certain outcomes namely external genital warts and CIN II and III, there is some evidence to suggest condom use is protective. Until further research results are reported, it would be prudent to continue to advocate for the consistent use of condoms during sexual activity.

Cost benefit or cost-effectiveness information

No data on cost-effectiveness was included in this review.

References used to outline issue


Other quality reviews on this topic


Related links

• Sexual Health and Sexually Transmitted Infections, Public Health Agency of Canada: http://www.phac-aspc.gc.ca/std-mts/index.html


• Sexual Health and Promotion – Healthy Living, Health Canada: http://www.hc-sc.gc.ca/hl-vs/sex/index_e.html
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