

## Health & Research Journal

Vol 6, No 4 (2020)

Volume 6 Issue 4 October - December 2020



Volume 6 Issue 4 October - December 2020

### EDITORIAL

THE EFFECT OF EMTRICITABINE AND TENOFOVIR USE IN THE PRE-EXPOSURE PROFYLAXIS (PREP) FOR HIV TRANSMISSION

### BRIEF REPORT

DEPRESSION IN DIABETIC FOOT ULCERS

### SPECIAL ARTICLES

DEVELOPING SUPPORT NETWORKS FOR SUCCESSFUL IMPLEMENTATION OF INNOVATIVE EDUCATIONAL PROGRAMMES: THE CASE OF "EVIDENCE-BASED PRACTICE IN NURSING" CONTINUING EDUCATION PROGRAMME IN GREECE

### RESEARCH ARTICLES

EXPLORATION THE QUALITY OF LIFE AND THE RELATED FACTORS IN WOMEN WITH RECENT DIAGNOSIS OF GYNECOLOGICAL CANCER, BEFORE THE SURGICAL TREATMENT, IN GREECE

ADAPTATION OF "NICHOLSON MCBRIDE RESILIENCE QUESTIONNAIRE" (NMRQ) IN GREEK. A RELIABILITY AND VALIDITY STUDY IN AN EPIDEMIOLOGICAL GREEK SAMPLE

Published in cooperation with the Postgraduate Program "Intensive Care Units", the Hellenic Society of Nursing Research and Education and the Helerga

### The effect of emtricitabine and tenofovir use in the pre-exposure profylaxis (prep) for HIV transmission

*Maria Goula*

doi: [10.12681/healthresj.25625](https://doi.org/10.12681/healthresj.25625)

### To cite this article:

Goula, M. (2020). The effect of emtricitabine and tenofovir use in the pre-exposure profylaxis (prep) for HIV transmission. *Health & Research Journal*, 6(4), 101–104. <https://doi.org/10.12681/healthresj.25625>

## EDITORIAL ARTICLE

## THE EFFECT OF EMTRICITABINE AND TENOFOVIR USE IN THE PRE-EXPOSURE PROFYLAXIS (PrEP) FOR HIV TRANSMISSION

Over the past few decades, the introduction and growing use of emtricitabine and tenofovir (FTC / TDF) has represented a major advance in the management of sexually transmitted infections such as Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV) and Hepatitis C Virus (HCV) infections.<sup>1</sup>

Emtricitabine (FTC) is a synthetic nucleoside analogue of cytidine with specific activity against HIV-1, HIV-2 and HBV. It competitively inhibits HIV-1 reverse transcriptase resulting in the termination of DNA chain synthesis. Also, emtricitabine is a weak inhibitor of mammalian  $\alpha$ ,  $\beta$  and  $\epsilon$  DNA polymerases and mitochondrial DNA polymerase gamma.<sup>1</sup>

Tenofovir (TDF) inhibits HIV-1 reverse transcriptase and HBV polymerase by direct competitive binding to the natural deoxyribonucleotide substrate as well as by terminating DNA chain synthesis after its incorporation into DNA.<sup>1</sup>

HIV is an RNA-virus, which belongs to the retrovirus family and affects mainly macrophages and T-helper lymphocytes (CD4+). It is transmitted through sexual contact, hematogenously and vertically from mother to child during pregnancy, childbirth or breastfeeding.<sup>1</sup>

We conducted a literature review to examine the efficacy of the combination of emtricitabine and tenofovir in sexually transmitted infections, such as HIV, HBV and HCV. We particularly focused on the efficacy of the combination of emtricitabine and tenofovir in HIV infection.

Eight studies enrolling a total of 32,395 participants were selected, comparing emtricitabine / tenofovir to placebo, tenofovir per os, tenofovir in vaginal gel before or / and after sexual activity. The overall protective efficacy of daily FTC / TDF prophylaxis was 62.2% (95% CI, 21.5 to 83.4; P=0.03). There was no statistically significant difference between the combination of FTC / TDF and TDF monotherapy in men, women and couples.

According to a study by Grant et al, 2010, in 2,499 MSM (Men Sex with Men) and TGW (Trans Gender Women), the protective effect of FTC / TDF was compared to that of placebo. 10 were found to be infected with HIV at enrollment and 100 became infected during follow-up (36 in the FTC / TDF group and 64 in the placebo group), indicating a 44% reduction in the incidence of HIV (95% CI 15-63; p=0.005).<sup>2</sup>

According to the study by Thigpen et al, 2012, in a total of 1,219 male and female participants, daily FTC / TDF prophylaxis prevented HIV infection. The overall protective efficacy of FTC / TDF was 62.2% (95% CI, 21.5 to 83.4; P=0.03).<sup>3</sup>

In the study of Baeten et al, 2012, in a total of 4,758 couples, the protective effect of FTC / TDF was compared to that of TDF. No statistically significant difference was found between the two groups (P=0.23). Both regimens reduced HIV infections in men and women with comparable efficacy.<sup>4</sup>

In the study of Murnane et al, 2013, out of a total of 4,733 male and female participants, including subgroups of women with a high incidence of HIV-1 infection, the protective effect of FTC / TDF was compared to that of TDF. The overall incidence of HIV-1 in the placebo arm was 2.0 per 100 person-years and Pre-Exposure Prophylaxis (PrEP) efficacy was 67%

(95% CI 41-81,  $p<0.001$ ) for TDF and 75% (95% CI 55-87,  $p<0.001$ ) for FTC / TDF. Among women enrolled, overall HIV-1 incidence in the placebo arm was 2.8 per 100 person-years, TDF efficacy was 71% (95% CI 37-87,  $p=0.002$ ) and FTC / TDF efficacy was 66% (95% CI 28-82,  $p=0.05$ ). Among higher-risk subgroups PrEP (FTC / TDF and TDF) was protective against acquisition of HIV-1 with an efficacy ranging from 64% to 84%.<sup>5</sup>

Another study by Baeten et al, 2014, in a total of 4,410 couples, showed that plasma TDF detection levels correlated with a relative risk reduction in HIV-1 acquisition from 85%-93%, depending on whether they received TDF or FTC / TDF respectively ( $P<0.0001$  in both groups). Prevention efficacy for HIV-1 infection was not statistically significant in both groups ( $P=0.16$ ).<sup>6</sup>

The results of a study by Molina et al, 2015, out of a total of 414 MSM participants, 400 individuals who had no HIV infection were enrolled (199 in the FTC / TDF group and 201 in the placebo group). All participants were followed for an average of 9.3 months. A total of 16 HIV-1 infections occurred during follow-up, 2 in the FTC / TDF group and 14 in the placebo group. The relative reduction in the FTC / TDF group is 86% (95% CI 40 to 98;  $p=0.002$ ).<sup>7</sup>

McCormack et al, 2015, a total of 544 MSM participants were randomly assigned to receive daily combined emtricitabine / tenofovir either immediately or after a period of 1 year. Three HIV infections occurred in the immediate group versus 20 in the second group despite 174 prescriptions of post exposure prophylaxis in the second group (relative reduction 86%, 90% CI 64-96,  $p=0.0001$ ).<sup>8</sup>

Finally, in the study of Marazzo et al, 2015, in 5,029 women of childbearing age the protective effect of FTC / TDF was compared to that of TDF and TDF gel. Out of the 312 seroconversions included in the primary analysis, 52 occurred in the TDF group, 61 in the FTC / TDF group, 61 in the TDF gel group, 60 in the oral placebo group and 70 in the placebo gel group. The effectiveness was -49.0% with TDF (hazard ratio for infection, 1.49; 95% CI, 0.97 to 2.29), -4.4% with FTC / TDF (hazard ratio 1.04; 95% CI 0.73 to 1.49) and -14.5% with TDF gel (hazard ratio, 0.85; 95% CI, 0.61 to 1.21). There was no significant difference in the rate of HIV-1 seroconversion between the group receiving any study product and the group receiving the corresponding placebo, and the incidence of HIV-1 seroconversion did not change significantly during the study.

Consequently, the use of emtricitabine and tenofovir is more effective in preventing transmission of HIV compared to placebo or other combinations. The protective effect of FTC / TDF compared to TDF monotherapy was not statistically significant.

## References

1. Antiretroviral therapy: current drugs, Pau AK, George JM, Infect Dis Clin North Am. 2014 Sep;28(3):371-402. doi: 10.1016/j.idc.2014.06.001.

2. Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, Vargas L, Goicochea P, Casapía M, Guanira-Carranza JV, Ramirez-Cardich ME, Montoya-Herrera O, Fernández T, Veloso VG, Buchbinder SP, Chariyalertsak S, Schechter M, Bekker LG, Mayer KH, Kallás EG, Amico KR, Mulligan K, Bushman LR, Hance RJ, Ganoza C, Defechereux P, Postle B, Wang F, McConnell JJ, Zheng JH, Lee J, Rooney JF, Jaffe HS, Martinez AI, Burns DN, Glidden DV; iPrEx Study Team. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *N Engl J Med*. 2010 Dec 30;363(27):2587-99. doi: 10.1056/NEJMoa1011205. Epub 2010 Nov 23. PubMed PMID: 21091279; PubMed Central PMCID: PMC3079639.
3. Thigpen MC, Kebaabetswe PM, Paxton LA, Smith DK, Rose CE, Segolodi TM, Henderson FL, Pathak SR, Soud FA, Chillag KL, Mutanhaurwa R, Chirwa LI, Kasonde M, Abebe D, Buliva E, Gvetadze RJ, Johnson S, Sukalac T, Thomas VT, Hart C, Johnson JA, Malotte CK, Hendrix CW, Brooks JT; TDF2 Study Group. Antiretroviral preexposure prophylaxis for heterosexual HIV transmission in Botswana. *N Engl J Med*. 2012 Aug 2;367(5):423-34. doi: 10.1056/NEJMoa1110711. Epub 2012 Jul 11. PubMed PMID: 22784038.
4. Baeten JM, Donnell D, Ndase P, Mugo NR, Campbell JD, Wangisi J, Tappero JW, Bukusi EA, Cohen CR, Katabira E, Ronald A, Tumwesigye E, Were E, Fife KH, Kiarie J, Farquhar C, John-Stewart G, Kakia A, Odoyo J, Mucunguzi A, Nakku-Joloba E, Twesigye R, Ngure K, Apaka C, Tamooch H, Gabona F, Mujugira A, Panteleeff D, Thomas KK, Kidoguchi L, Krows M, Revall J, Morrison S, Haugen H, Emmanuel-Ogier M, Ondrejcek L, Coombs RW, Frenkel L, Hendrix C, Bumpus NN, Bangsberg D, Haberer JE, Stevens WS, Lingappa JR, Celum C; Partners PrEP Study Team. Antiretroviral prophylaxis for HIV prevention in heterosexual men and women. *N Engl J Med*. 2012 Aug 2;367(5):399-410. doi: 10.1056/NEJMoa1108524. Epub 2012 Jul 11. PubMed PMID: 22784037; PubMed Central PMCID: PMC3770474.
5. Murnane PM, Celum C, Mugo N, Campbell JD, Donnell D, Bukusi E, Mujugira A, Tappero J, Kahle EM, Thomas KK, Baeten JM; Partners PrEP Study Team. Efficacy of preexposure prophylaxis for HIV-1 prevention among high-risk heterosexuals: subgroup analyses from a randomized trial. *AIDS*. 2013 Aug 24;27(13):2155-60. doi: 10.1097/QAD.0b013e3283629037. PubMed PMID: 24384592; PubMed Central PMCID: PMC3882910.
6. Baeten JM, Donnell D, Mugo NR, Ndase P, Thomas KK, Campbell JD, Wangisi J, Tappero JW, Bukusi EA, Cohen CR, Katabira E, Ronald A, Tumwesigye E, Were E, Fife KH, Kiarie J, Farquhar C, John-Stewart G, Kidoguchi L, Coombs RW, Hendrix C, Marzinke MA, Frenkel L, Haberer JE, Bangsberg D, Celum C; Partners PrEP Study Team. Single-agent tenofovir versus combination emtricitabine plus tenofovir for pre-exposure prophylaxis for HIV-1 acquisition: an update of data from a randomised, double-blind, phase 3 trial. *Lancet Infect Dis*. 2014 Nov;14(11):1055-1064. doi: 10.1016/S1473-3099(14)70937-5. Epub 2014 Oct 7. PubMed PMID: 25300863; PubMed Central PMCID: PMC4252589.
7. Molina JM, Capitant C, Spire B, Pialoux G, Cotte L, Charreau I, Tremblay C, Le Gall JM, Cua E, Pasquet A, Raffi F, Pintado C, Chidiac C, Chas J, Charbonneau P, Delaugerre C, Suzan-Monti M, Loze B, Fonsart J, Peytavin G, Cheret A, Timsit J, Girard G, Lorente N, Préau M, Rooney JF, Wainberg MA, Thompson D, Rozenbaum W, Doré V, Marchand

- L, Simon MC, Etien N, Aboulker JP, Meyer L, Delfraissy JF; ANRS IPERGAY Study Group. On-Demand Preexposure Prophylaxis in Men at High Risk for HIV-1 Infection. *N Engl J Med*. 2015 Dec 3;373(23):2237-46. doi: 10.1056/NEJMoa1506273. Epub 2015 Dec 1. PubMed PMID: 26624850.
8. McCormack S, Dunn DT, Desai M, Dolling DI, Gafos M, Gilson R, Sullivan AK, Clarke A, Reeves I, Schembri G, Mackie N, Bowman C, Lacey CJ, Apea V, Brady M, Fox J, Taylor S, Antonucci S, Khoo SH, Rooney J, Nardone A, Fisher M, McOwan A, Phillips AN, Johnson AM, Gazzard B, Gill ON. Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial. *Lancet*. 2016 Jan 2;387(10013):53-60. doi: 10.1016/S0140-6736(15)00056-2. Epub 2015 Sep 9. PubMed PMID: 26364263; PubMed Central PMCID: PMC4700047.
9. Marrazzo JM, Ramjee G, Richardson BA, Gomez K, Mgodhi N, Nair G, Palanee T, Nakabiito C, van der Straten A, Noguchi L, Hendrix CW, Dai JY, Ganesh S, Mkhize B, Taljaard M, Parikh UM, Piper J, Mâsse B, Grossman C, Rooney J, Schwartz JL, Watts H, Marzinke MA, Hillier SL, McGowan IM, Chirenje ZM; VOICE Study Team. Tenofovir-based preexposure prophylaxis for HIV infection among African women. *N Engl J Med*. 2015 Feb 5;372(6):509-18. doi: 10.1056/NEJMoa1402269. PubMed PMID: 25651245; PubMed Central PMCID: PMC4341965.

**Maria Goula**

Consultant of Department of Dermatology and Venereology,  
General Hospital of Thessaloniki IPPOKRATEIO,  
Greece, e-mail: drmgoula@gmail.com