

ABSTRAK

Latar belakang: Metformin merupakan terapi lini pertama untuk DM tipe 2, namun pemberian secara oral memiliki bioavailabilitas rendah dan menyebabkan gangguan gastrointestinal. *Microneedle patch* merupakan sistem penghantaran obat yang memungkinkan pelepasan obat secara terkontrol melalui penggunaan polimer. Kombinasi PVP dan etil selulosa belum ditemukan dalam sistem *microneedle* untuk pelepasan metformin.

Tujuan: Penelitian ini bertujuan untuk mengetahui perbedaan hasil sifat fisik dan kimia, daya penetrasi, serta persentase obat yang dapat terpenetrasi ke dalam cairan tubuh dari *microneedle film* metformin antarvariasi konsentrasi kombinasi polimer PVP dan etil selulosa berdasarkan jumlah kumulatif zat terpenetrasi (Q).

Metode: Penelitian ini merupakan studi eksperimental laboratorium. Penelitian diawali dengan formulasi menggunakan kombinasi polimer PVP dan etil selulosa, dilanjutkan dengan evaluasi sediaan.

Hasil: Terdapat perbedaan signifikan pada beberapa pengujian evaluasi sifat fisik dan kimia, terdapat perbedaan signifikan hasil daya penetrasi pada F1, F2, dan F3 berturut-turut yaitu 3832,78 $\mu\text{g}/\text{cm}^2$; 5043,49 $\mu\text{g}/\text{cm}^2$; 5933,46 $\mu\text{g}/\text{cm}^2$. Persentase obat yang dapat terpenetrasi ke dalam cairan tubuh berdasarkan nilai Q pada F1, F2, dan F3 berturut-turut yaitu 45,40%; 60,11%; 71,15%.

Kesimpulan: Variasi konsentrasi dari kombinasi polimer PVP dan etil selulosa mempengaruhi hasil sifat fisik dan kimia, daya penetrasi dan persentase obat yang terpenetrasi dari *microneedle film* metformin yaitu 45,40%; 60,11%; 71,15%.

Kata kunci: *Diabetes mellitus, Metformin, Microneedle, PVP, Etil Selulosa*

ABSTRACT

Background: Metformin is the first-line treatment for type-2 diabetes, but oral administration has low bioavailability and causes gastrointestinal disturbances. A *microneedle* patch is a drug delivery system that enables controlled drug release using polymers. PVP-ethyl cellulose has not yet been used in *microneedle* systems for metformin release.

Aim: This study aims to determine the differences in physical-chemical properties, penetration capacity, and the percentage of drug that can penetrate body fluids among metformin *microneedle films* with varying concentrations of the PVP-ethyl cellulose, based on the cumulative amount of drug that has penetrated (Q).

Methods: This research is a laboratory-based experimental study. The study began with the formulation of a combination of PVP-ethyl cellulose, followed by an evaluation of the formulation.

Result: There were significant differences in several tests evaluating physical and chemical properties; there were significant differences in penetration capacity results for F1, F2, and F3, which were 3832.78 $\mu\text{g}/\text{cm}^2$; 5043.49 $\mu\text{g}/\text{cm}^2$; and 5933.46 $\mu\text{g}/\text{cm}^2$. The percentage of the drug that can penetrate into body fluids, based on the Q values for F1, F2, and F3, were 45.40%, 60.11%, and 71.15%.

Conclusion: Variations in the concentration of the PVP-ethyl cellulose affect the physical-chemical properties, penetration capacity, and percentage of drug penetrated from the metformin *microneedle film* were 45.40%, 60.11%, and 71.15%.

Keywords: Diabetes mellitus, Metformin, *Microneedle*, PVP, Ethyl Cellulose