Abstract. Pedestrian infrastructure has a greater impact on pedestrian mobility, where large numbers of people congregate and move. Pedestrian movement must be properly analyzed and modelled to produce a safe and comfortable movement. This paper discusses the pedestrian flow simulation using a macroscopic model with the Lax-Wendroff scheme. In this simulation, velocity function is generated by polynomial regression method from observation data. This velocity function is the relationship between average velocity and pedestrian density over fixed domain. In this research, density and velocity pedestrian data are obtained from direct observation on Jalan Lampulo, Banda Aceh, Indonesia. Here, two best polynomial functions are obtained as velocity functions, i.e., quadratic function z_2 and polynomial function of degree six (z_6). The simulation results show that at final time T = 2 seconds and T = 4 seconds, the position of pedestrian using the velocity function z_6 is approximately 0.6 meters in front of the pedestrian with velocity function z_2. A pedestrian using velocity function z_6 is approximately 1 meter in front of the pedestrian with velocity function z_2 at final time T = 6 seconds. The simulation continues until at final time T = 8 seconds, the position of pedestrian using the velocity function z_6 is approximately 1.2 meters in front of the pedestrian with velocity function z_2. The density of z_6 lower than z_2, this is due to the higher velocity of z_6 which causes pedestrians move faster. Based on numerical simulations, it shows that pedestrian with velocity function z_6 is faster than with velocity function z_2. Moreover, the linearity of coefficients of the polynomial functions is analyzed using hypothesis testing in this research.