

# Red Blood Cell Distribution Width Associates with All-Cause Mortality



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## Introduction

- Red cell distribution width is a marker used for the differentiation of anemias and it is known to be elevated in most cases of iron, vitamin B12 and folate deficiencies. A growing body of evidence suggests an association to outcomes such as hospitalizations and mortality in the general population, populations with chronic diseases such as heart failure and more recently chronic kidney disease.
- We aimed to analyze the relationship of Red Cell Distribution Width (RDW) to all-cause mortality in a large European cohort of hemodialysis patients of the international MONitoring Dialysis Outcomes (MONDO) initiative.

## Methods

- For this analysis, we used data from incident patients from Europe between 2000 and 2012 from the MONDO database initiative. We computed means of pre-HD RDW in the first year on HD for patients commencing HD treatment and stratified patients as per tertiles (G1: RDW < 14.7%; G2: 14.7% ≤ RDW ≤ 15.9; and G3: RDW > 15.9).
- The risk of all-cause mortality in the second year on HD in the stratified groups was analyzed using Kaplan-Meier curve analysis, Log-rank test and the construction of a Cox Proportional Hazards model including age, gender, interdialytic weight gain, neutrophil-lymphocyte ratio and normalized protein catabolic rate as additional predictors. A univariate Cox model with RDW as the only predictor was constructed and used to plot a spline function with an indicated 95% CI to investigate the risk of death as per RDW in a continuous fashion. A p-value less than 0.05 was considered significant and all analyses were conducted in R version 3.3.2 (nickname "Sincere Pumpkin Patch").

## Results

- We studied 8817 hemodialysis patients (63 ± 15 years, 59% males, interdialytic weight gain 2.9 ± 1.1% of post-dialysis body weight, RDW 15.3 ± 1.7%), and 1422 of those died during the second year.
- Kaplan Meier curve analysis and Log Rank test showed a significantly decreasing survival probability with increasing RDW tertile (Figure 1). This relationship was consistent (Figure 2) in uni- and multi-variate Cox regression analysis [HR G2 1.5 (95% CI 1.2 to 1.8) and HR G3 2.1 (95% CI 1.8 to 2.5) per % increase of RDW, respectively, in reference to G1]. The latter analysis also confirmed significant associations between age HR G2 1.5 (95% CI 1.2 to 1.8, interdialytic weight gain, neutrophil-lymphocyte ratio, normalized protein catabolic rate and all-cause mortality.

## Discussion

- Our data confirms a relationship between increasing RDW and risk of all-cause mortality in dialysis patients and suggests RDW is a marker that should be considered in clinical nephrology. Additional analysis of predictors of RDW, in different populations (i.e. dialysis-independent patients with chronic kidney disease), different dialysis modality (such as peritoneal dialysis or Hemodiafiltration), and in large populations are needed to understand the reported pathophysiological phenomenon in more detail.

Figure 1: Survival probability in the three studied tertiles of red blood cell distribution width.

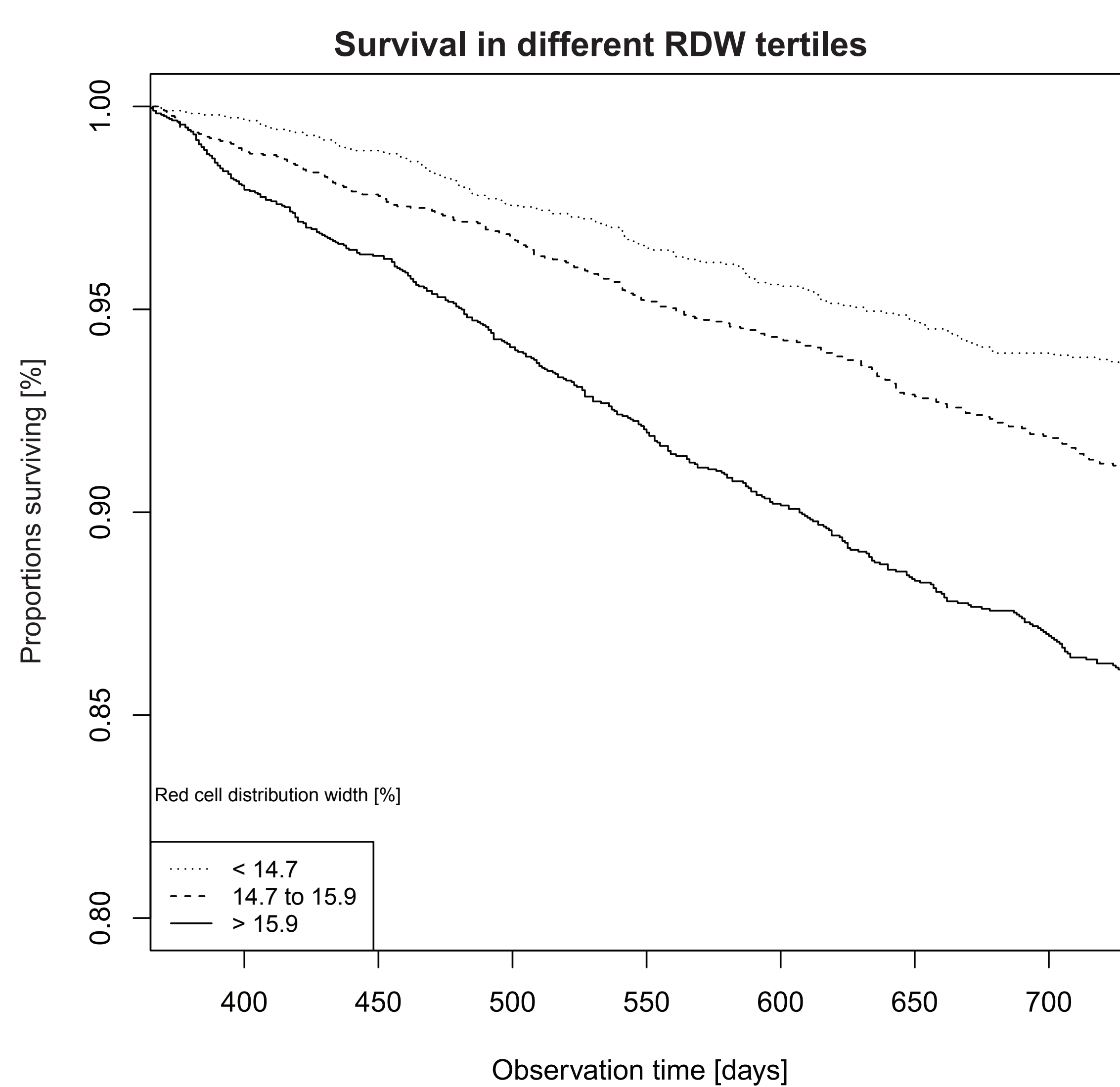
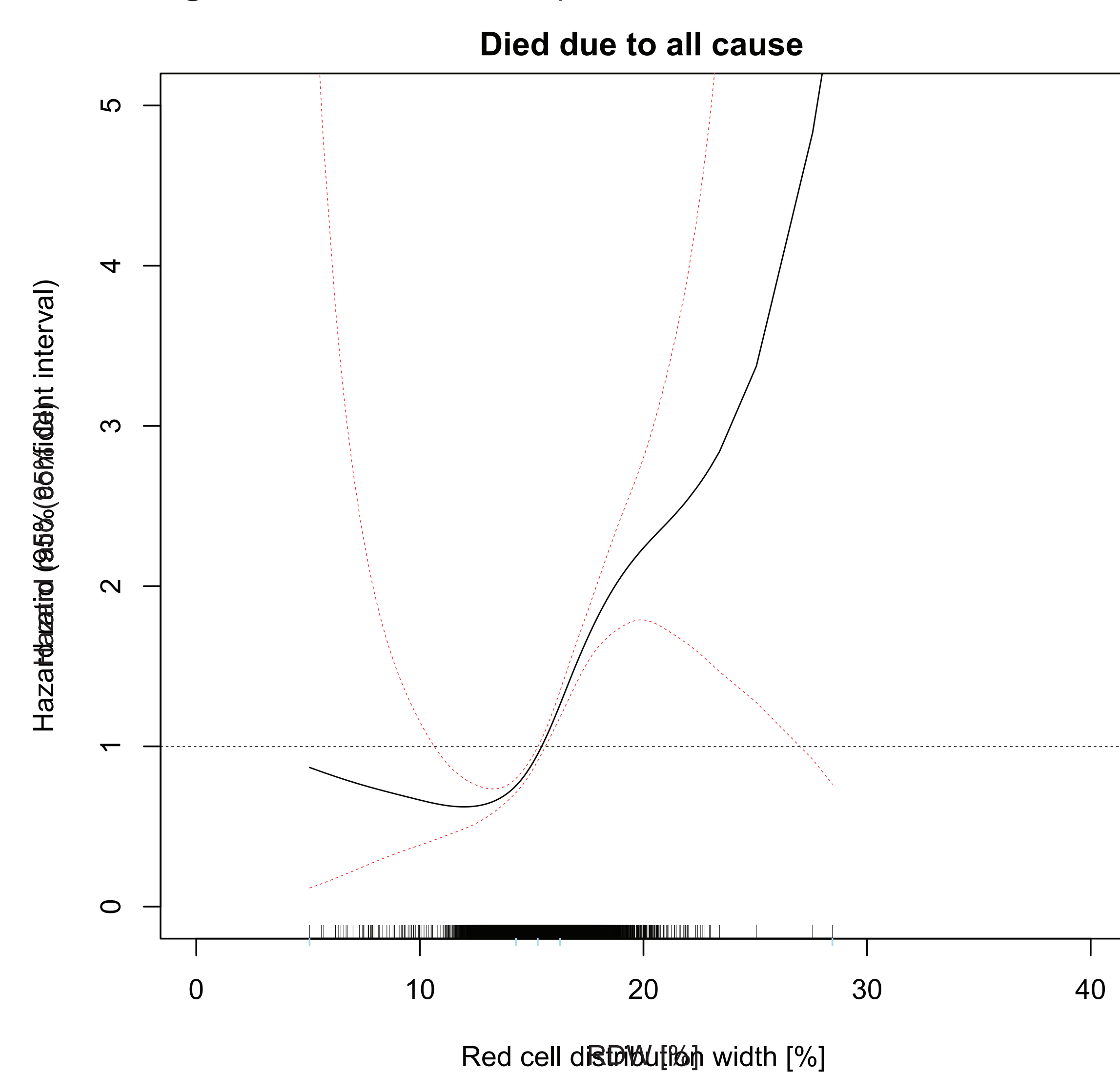


Figure 2: Risk of death as per red blood cell distribution width.



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